

BRAIN DRAIN: REBUILDING THE FEDERAL SCIENTIFIC WORKFORCE

HEARING BEFORE THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT OF THE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY HOUSE OF REPRESENTATIVES ONE HUNDRED SEVENTEENTH CONGRESS

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C O N T E N T S

March 17, 2021

	Page
Hearing Charter	2
Opening Statements	
Statement by Representative Bill Foster, Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space, and Technology, U.S. House of Representatives	9
Written Statement	10
Statement by Representative Jay Obernolte, Ranking Member, Subcommittee on Investigations and Oversight, Committee on Science, Space, and Technology, U.S. House of Representatives	11
Statement by Representative Pete Sessions, Committee on Science, Space, and Technology, U.S. House of Representatives	12
Written statement by Representative Eddie Bernice Johnson, Chairwoman, Committee on Science, Space, and Technology, U.S. House of Representatives	12
Witnesses:	
Ms. Candice Wright, Acting Director, Science, Technology Assessment, and Analytics, U.S. Government Accountability Office	
Oral Statement	14
Written Statement	16
Mr. Max Stier, President and CEO, Partnership for Public Service	
Oral Statement	38
Written Statement	40
Dr. Andrew Rosenberg, Director of the Center for Science and Democracy, Union of Concerned Scientists	
Oral Statement	55
Written Statement	57
Dr. Elizabeth Southerland, Former Director of Science and Technology, Office of Water, Environmental Protection Agency	
Oral Statement	66
Written Statement	68
Discussion	74
Appendix I: Answers to Post-Hearing Questions	
Mr. Max Stier, President and CEO, Partnership for Public Service	88
Dr. Andrew Rosenberg, Director of the Center for Science and Democracy, Union of Concerned Scientists	90
Appendix II: Additional Material for the Record	
Report submitted by Representative Bill Foster, Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space, and Technology, U.S. House of Representatives	
“Scientific Brain Drain: Quantifying the Decline of the Federal Scientific Workforce,” Majority Staff	92

IV

	Page
Statements submitted by Representative Bill Foster, Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space, and Technology, U.S. House of Representatives	
American Federation of Government Employees (AFGE) Local 3403	116
Climate Science Legal Defense Fund	119
Report submitted by Dr. Andrew Rosenberg, Director of the Center for Science and Democracy, Union of Concerned Scientists	
“The Federal Brain Drain: Impacts on Science Capacity, 2016–2020,” Jacob Carter, Taryn MacKinney, Gretchen Goldman	124

**BRAIN DRAIN: REBUILDING
THE FEDERAL SCIENTIFIC WORKFORCE**

WEDNESDAY, MARCH 17, 2021

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Subcommittee met, pursuant to notice, at 10:03 a.m., via
Webex, Hon. Bill Foster [Chairman of the Subcommittee] presiding.

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON INVESTIGATIONS & OVERSIGHT
HEARING CHARTER**

Brain Drain: Rebuilding the Federal Scientific Workforce

Wednesday, March 17, 2021
10:00 a.m. ET
Cisco WebEx

PURPOSE

The purpose of the hearing is to assess recent widespread departures of career scientists from the Federal Government. The Subcommittee will examine the cause and extent of the employment decline within the federal scientific workforce, as well as the implications of a smaller scientific workforce for science-based agencies. The Subcommittee will also discuss potential policies to rebuild federal scientific capacity.

WITNESSES

- **Ms. Candice Wright**, Acting Director, Science, Technology Assessment, and Analytics, U.S. Government Accountability Office
- **Mr. Max Stier (STY-ur)**, President and CEO, Partnership for Public Service
- **Dr. Andrew Rosenberg**, Director, Center for Science and Democracy, Union of Concerned Scientists
- **Dr. Betsy Southerland (SUH-thur-lund)**, Former Director of Science and Technology, Office of Water, Environmental Protection Agency

OVERARCHING QUESTIONS

- How significantly have declining workforces impacted science agencies?
- What are the causes of scientific brain drain from the Federal Government?
- What are the implications of the loss of career scientists for federal scientific capacity and the ability of scientific agencies to fulfill their missions?
- How did recent workforce challenges impact longstanding efforts to promote greater diversity within the federal scientific workforce?
- What policies can most effectively support and rebuild a diverse, inclusive, and robust scientific workforce for the federal government?

The Federal Scientific Workforce: An Overview

No single definition establishes the parameters of the federal “scientific workforce.” Within any federal program charged with conducting or overseeing science and using scientific analysis to

inform decision-making, a wide range of career scientific personnel carry out the necessary functions to ensure that government policies are guided by accurate scientific knowledge. These career employees, largely employed within science, technology, engineering, and mathematics (STEM) occupations, constitute the civil service scientific workforce. The expertise and institutional knowledge that they develop over decades in government service provides the foundation of federal scientific capabilities.¹

Scientific Workforce Trends in the Federal Government

In recent years, an increasing number of scientific advocacy groups, academic stakeholders, and former federal scientists have expressed concern about the declining size of the federal scientific workforce.² In a 2018 survey of 63,000 scientific experts employed by the federal government, 79% reported workforce reductions in their agency over the previous twelve months. 87% believed that the workforce reductions had undermined their agency's mission.³ Additional analyses have identified large employment declines within key scientific agencies and offices over the previous four years.⁴

Committee staff reviewed employment data pertaining to seven science-based agencies within the Committee's jurisdiction:

- National Science Foundation (NSF)
- National Aeronautics and Space Administration (NASA)
- Department of Homeland Security's Science and Technology Directorate (DHS S&T)
- National Institute of Standards and Technology (NIST)
- Environmental Protection Agency (EPA)
- Department of Energy (DOE)
- National Oceanic and Atmospheric Administration (NOAA)

The following sections summarize the data findings. The employment data figures reflect the number of employees in pay status on the last day (September 30) of the fiscal year listed.

¹ Congressional Research Service, "Science and Technology Issues in the 116th Congress," R45491, February 6, 2019, accessed here: <https://crsreports.congress.gov/product/pdf/R/R45491/3>.

² For example, see Annie Gowan, Juliet Eilperin, Ben Guarino, and Andrew Ba Tran, "Science ranks grow thin in Trump Administration," *Washington Post*, January 23, 2020, accessed here: https://www.washingtonpost.com/climate-environment/science-ranks-grow-thin-in-trump-administration/2020/01/23/5d22b522-3172-11ea-a053-dc6d944ba776_story.html.

³ Center for Science and Democracy, "Science under Trump: Voices of Scientists across 16 Federal Agencies," *Union of Concerned Scientists*, August 7, 2018, accessed here: <https://www.ucsusa.org/sites/default/files/imagess/2018/08/science-under-trump-report.pdf>.

⁴ Emily Badger, Quoc Trung Bui, and Alicia Parlapiano, "The Government Agencies That Became Smaller, and Unhappier, Under Trump," *New York Times*, February 1, 2021, accessed here: <https://www.nytimes.com/2021/02/01/upshot/trump-effect-government-agencies.html>.

Total Agency Employment, FY 2009-2016-2020 (Full-Time Equivalent Employment, or FTEs)

	FY 2009	FY 2016	FY 2020	% Change (2016-2020)	% Change (2009-2020)
NSF	1,180	1,208	1,283	+ 6.2%	+ 8.7%
NASA	16,970	16,985	17,099	+ 0.7%	+ 0.8%
DHS S&T	359	442	421	- 4.8%	+ 17.3%
NIST	2,605	2,919	2,980	+ 2.1%	+ 14.4%
EPA	16,456	14,287	13,732	- 3.9%	- 16.6%
DOE	15,134	14,499	14,047	- 3.1%	- 7.2%
NOAA	12,323	11,148	11,260	+ 1.0%	- 8.6%

Over the past four years, NSF and NIST saw sizable workforce increases. Employment at NASA and NOAA was largely flat, with small increases at each agency equivalent to one percent growth or less. DHS S&T, EPA and DOE experienced significant workforce declines. EPA and DOE lost more than 1,000 employees combined between FY 2016 and FY 2020.

Over the past decade, NSF, NIST and DHS S&T increased their workforces substantially. NASA's workforce remained essentially flat extending back to FY 2009. EPA, DOE and NOAA underwent enormous workforce declines of 16.6%, 7.2% and 8.6%, respectively. The combined workforces of those three agencies have decreased by 4,874 employees since FY 2009. EPA alone lost more than 2,700 employees during the period.

Agency STEM Employment, FY 2009-2016-2020 (FTEs)

	FY 2009	FY 2016	FY 2020	% Change (2016-2020)	% Change (2009-2020)
NSF	355	423	492	+ 16.3%	+ 38.6%
NASA	10,479	11,133	11,548	+ 3.7%	+ 10.2%
DHS S&T	181	194	166	- 14.4%	- 8.3%
NIST	1,378	1,696	1,802	+ 6.3%	+ 30.8%
EPA ⁵	**	8,632	8,294	- 3.9%	**
DOE	4,703	4,993	4,993	0.0 %	+ 6.2%
NOAA	7,191	6,939	7,076	+ 2.0%	- 1.6%

Over the past four years, NSF, NIST, NASA and NOAA increased the size of their STEM workforces to varying degrees. NSF and NIST experienced very large STEM employment increases, including more than a 16% increase at NSF. NASA and NOAA experienced considerably smaller increases. DOE's STEM workforce did not increase by a single employee over four years and ended FY 2020 at exactly the same size as it had ended FY 2016. The STEM

⁵ Due to an apparent reclassification of certain STEM occupations during the Obama Administration, it is difficult to utilize STEM workforce data to reliably compare EPA STEM employment over the course of the entire decade. This analysis is limited to EPA STEM workforce data between the years FY 2016 and FY 2020, for which the data can be consistently applied.

workforces of EPA and DHS S&T declined outright. EPA lost 338 STEM employees over four years and DHS S&T lost over 14% of its STEM workforce.

Over the past decade, NSF, NIST, NASA and DOE increased the size of their STEM workforces. NSF and NIST enjoyed extraordinary STEM increases of more than 30%. NASA's STEM employment increased by more than 10%. The DOE STEM workforce increased by slightly more than 6%, with the entire increase occurring between FY 2009 and FY 2016. The STEM workforces at NOAA and DHS S&T actually declined over the course of the decade.

Agency Gender Employment, FY 2020 (FTEs)

	Male Employment	Female Employment	Workforce Male : Female Ratio	STEM Male Employment	STEM Female Employment	STEM Male : Female Ratio
NSF	503	780	1.0 : 1.5	268	224	1.2 : 1
NASA	11,229	5,870	1.9 : 1	8,721	2,827	3.1 : 1
DHS S&T	262	159	1.6 : 1	130	36	3.6 : 1
NIST	1,904	1,076	1.8 : 1	1,375	427	3.2 : 1
EPA	6,591	7,141	1 : 1.1	4,445	3,849	1.2 : 1
DOE	8,967	5,080	1.8 : 1	3,693	1,300	2.8 : 1
NOAA	7,380	3,880	1.9 : 1	5,180	1,896	2.7 : 1

Gender employment gaps persisted at all seven agencies at the end of FY 2020 between STEM workforces and total agency workforces. NSF and EPA employed majority-female agency workforces but majority-male STEM workforces. NASA, DHS S&T, and NIST had more than 3 men for every 1 woman employed in their STEM workforces. DOE and NOAA had nearly 3 men for every 1 woman employed in their STEM workforces.

Agency Racial and Ethnic Employment⁶, FY 2020 (FTEs)

	White Employment	Minority Employment	Workforce White : Minority Ratio	STEM White Employment	STEM Minority Employment	STEM White : Minority Ratio
NSF	700	579	1.2 : 1	351	138	2.5 : 1
NASA	12,095	4,994	2.4 : 1	8,657	2,885	3.0 : 1
DHS S&T	282	139	2 : 1	116	50	2.3 : 1
NIST	2,181	799	2.7 : 1	1,393	409	3.4 : 1
EPA	8,934	4,782	1.9 : 1	5,829	2,458	2.4 : 1

⁶ OPM's FedScope database defines "Minority" employees as those federal employees identifying as: Hispanic or Latino; American Indian or Alaska Native; Asian; Black or African American; or Native Hawaiian or Other Pacific Islander. Additionally, FedScope's "Minority" employment data includes federal employees who identify as "more than one race."

DOE	10,174	3,868	2.6 : 1	3,687	1,303	2.8 : 1
NOAA	8,959	2,301	3.9 : 1	6,084	992	6.1 : 1

All seven agencies also exhibited racial and ethnic employment gaps between STEM workforces and total agency workforces at the end of FY 2020. NSF, DHS S&T, EPA and DOE employed more than 2 white STEM employees for every 1 member of a minority group employed in their STEM workforces. NASA and NIST employed at least 3 white STEM employees for every 1 member of a minority group employed in their STEM workforces. NOAA employed over 6 white STEM employees for every 1 member of a minority group employed in its STEM workforce.

Extensive research has demonstrated that group diversity encourages creativity and innovation in scientific fields, which leads to more successful research outcomes.⁷ Diverse teams outperform homogeneous teams due to their ability to elevate talented individuals from a larger cross-section of society and benefit from the resulting broader range of perspectives.⁸ Additionally, the increasing diversity of American society as a whole makes it essential for the Federal Government to encourage access for historically underrepresented groups to the federal STEM workforce in order to meet STEM workforce demands in the years and decades ahead.⁹ Gender, racial and ethnic employment gaps within the federal STEM workforce risk undermining the ability of science agencies to properly support federal scientific responsibilities.

Causes and Consequences of Scientific Workforce Declines at Certain Agencies

Several factors contribute to the trends identified above. Long-term budget cuts forced some science agencies to implement hiring freezes, early retirement and buyout programs for career employees in order to operate within budgetary constraints. The federal hiring process for civil servants via USAJobs.com can take significantly longer for applicants than the private sector. Structured pay scales and ceilings for civil servants make some federal scientific jobs less financially lucrative than comparable private sector opportunities.

Additionally, the past four years witnessed a number of prominent controversies pertaining to the role of science in federal policymaking that impacted the scientific workforce. The Trump Administration's budget proposals called for deep cuts to federal science programs and signaled a lack of political support for the work of federal scientists, despite their rejection by Congress. Agency leaders imposed bureaucratic obstacles upon scientific activities that undermined the ability of career scientists to advance the missions of their agencies. In a few instances, entire agencies such as the Economic Research Service and Agricultural Research Service in the Department of Agriculture were moved from the National Capital Region to other parts of the country, resulting in the departures of hundreds of civil servant economists and researchers from

⁷ Interagency Policy Group on Increasing Diversity in the STEM Workforce By Reducing the Impact of Bias, "Reducing the Impact of Bias in the STEM Workforce," *Office of Science and Technology Policy (OSTP) and Office of Personnel Management (OPM)*, Report Digest, November 2016, accessed here: https://www.si.edu/content/OEEMA/OSTP-OPM_ReportDigest.pdf.

⁸ *Id.*

⁹ *Id.*

government service.¹⁰ Finally, a series of conspicuous scientific integrity violations caused federal scientists to question whether political leadership in their agencies respected the proper role of science in policymaking. Varying procedures, uneven implementation, and differing methods for identifying and addressing violations of scientific integrity policies contributed to uncertainty among career employees regarding scientific integrity in certain agencies.¹¹

As a result, the morale of the federal scientific workforce declined during the Trump Administration. The same 2018 survey found that censorship, political interference and poor leadership at key science-based agencies had weakened the morale of the federal scientific workforce and reduced the job effectiveness and satisfaction of career scientists.¹² A reduced scientific workforce risks undermining the Federal Government's scientific capabilities and affecting the quality of federal policymaking based on science. As large numbers of career scientists departed in recent years, work backlogs have increased, research grants have been hindered, and the pace of scientific research has slowed due to the increased workload borne by the smaller number of scientists who remain. Environmental enforcement efforts have also suffered due to the presence of fewer expert personnel.¹³

Tools for Consideration

A host of policy options exist to rebuild the federal scientific workforce, including:

- Increasing budgets for science agencies and offices;
- Strengthening agency scientific integrity policies;
- Utilizing direct-hire authorities for scientific occupations, such as the direct hire authorities authorized in October 2018 by OPM for a series of STEM occupations, which were utilized for fewer than 100 new STEM hires through August 2020¹⁴;
- Expanding fellowship opportunities for scientists early in their careers, such as the reinstatement of the Presidential Management Fellowship STEM-specific track¹⁵;

¹⁰ Ben Guarino, "Many USDA workers to quit as research agencies move to Kansas City: 'The brain drain we all feared,'" *Washington Post*, July 18, 2019, accessed here: <https://www.washingtonpost.com/science/2019/07/18/many-usda-workers-quit-research-agencies-move-kansas-city-brain-drain-we-all-feared/>.

¹¹ U.S. Government Accountability Office, "Scientific Integrity Policies: Additional Actions Could Strengthen Integrity of Federal Research," GAO-19-265, April 2019, accessed here: <https://www.gao.gov/assets/gao-19-265.pdf>.

¹² Center for Science and Democracy, "Science under Trump: Voices of Scientists across 16 Federal Agencies," *Union of Concerned Scientists*, August 7, 2018, accessed here: <https://www.ucsusa.org/sites/default/files/imagess/2018/08/science-under-trump-report.pdf>.

¹³ Tammy Webber and Matthew Brown, "Biden environmental challenge: Filling vacant scientist jobs," *Associated Press*, January 30, 2021, accessed here: <https://apnews.com/article/joe-biden-donald-trump-climate-climate-change-environment->

¹⁴ United States Office of Personnel Management Memorandum, "Announcing Government-wide Direct Hire Appointing Authorities," October 11, 2018, accessed here: <https://www.sfs.opm.gov/Documents/GovHireAppointingAuthorityMemo.pdf>.

¹⁵ Jacob Carter, Taryn MacKinney, and Gretchen Goldman, "The Federal Brain Drain: Impacts on Science Capacity, 2016-2020," *Union of Concerned Scientists*, January 30, 2021, accessed here: <https://www.ucsusa.org/resources/federal-brain-drain#top>.

- Strengthening diversity and inclusion benchmarks within the recruitment, hiring and promotion processes for scientific agencies and occupations;
- Deepening collaborative initiatives between science-based agencies and Historically Black Colleges and Universities (HBCUs) and other Minority Serving Institutions (MSIs) to promote greater access for students from historically underrepresented groups to federal scientific occupations;
- Broadening mentorship programs to better cultivate the professional development of early and mid-career STEM employees;
- Intensifying the recruitment of retired scientists to return to government service for short-term employment in order to fill immediate capacity shortfalls;
- Supporting the morale of career scientists by elevating the role of scientific evidence in the policymaking process and reinforcing the independence of scientific research activities.

Chairman FOSTER. The hearing will now come to order. Without objection, the Chair is authorized to declare recess at any time.

And before I deliver my opening remarks, I just wanted to note the unusual circumstances under which we're operating today. Pursuant to *House Resolution 8*, today, the Subcommittee is meeting virtually. I want to announce a couple of reminders to the Members about the conduct of this remote hearing. First, Members should keep their video feed on as long as they are present at the hearing. Members are responsible for their own microphones. Please also keep your microphones muted unless you're speaking. If Members have documents they wish to submit for the record, please email them to the Committee Clerk, whose email has been circulated prior to the hearing.

Well, good morning, and thank you to all of our Members and panelists for joining us today for this Subcommittee hearing on the brain drain from the Federal scientific workforce. This is our first Subcommittee hearing of the 117th Congress, and I'm very pleased to return as the Chairman of the Investigations and Oversight Subcommittee to continue our important work. I'm also pleased to welcome Ranking Member Obernolte to the Subcommittee. I look forward to working together in support of America's scientific community to ensure that our country remains its position—remains in its position as the global leader in science and innovation.

Today's hearing focuses on a subject close to my heart: the Federal scientific workforce. The scientists of the Federal Government are a pillar of some of America's greatest achievements, and federally funded science is a key to long-term economic growth. Today's hearing is doubly important. First, the STEM (science, technology, engineering, and mathematics) workforce has been under stress in recent years, as we will be discussing. And secondly, we stand on the cusp of what we all hope will be kind of a Sputnik-like moment for federally funded scientific research.

We're in a historic position where Democrats and Republicans on this Committee and Republicans and Democrats in the Senate have dueling proposals to double the scientific research budget in this country. And maintaining proper stewardship on what we all hope will be a historic return to an adequate level of funding for scientific research will require a top-notch and well-experienced federally funded STEM workforce.

Government scientists oversee grants for priority research areas, fund basic research that expands our horizons through breakthrough discoveries, and lead the way in helping to address the most pressing challenges of our time, from climate change and clean energy to public health, to national security. Whether pushing the boundaries of scientific knowledge or informing policymaking with the best available science, government scientists perform a vital public service.

Unfortunately, recent years have been difficult for many career government scientists. The last Administration's hostility toward evidence-based decisionmaking often created a significant tension with scientists simply attempting to carry out their duties. And as violations of scientific integrity worsened and political interference escalated, scientists often felt marginalized and demoralized. Far too often, they saw their expertise ignored, their motives were im-

pugned, their work was dismissed. And this crisis arrived after years of budget constraints had already slashed their funding.

Sadly, the consequences of—one of the consequences of failure to properly support the Federal scientific workforce are clear: In critical science-based agencies and occupations, far too many scientists have recently decided to leave the Federal Government. The statistics are alarming. According to data reviewed by the Committee staff, EPA's (Environmental Protection Agency's) workforce declined by 3.9 percent in the last Administration and over 16 percent since 2009. The DOE's (Department of Energy's) civil service STEM workforce has not increased in four years. The EPA, DOE, and NOAA (National Oceanic and Atmospheric Administration) have all lost large numbers of STEM workers in key occupations such as the environmental protection specialists, nuclear engineers, and oceanographers. Even offices with broad bipartisan support have not been spared. The DOE's Office of Nuclear Energy lost over 20 percent of its workforce in just the first three years of the previous Administration. And in many science agencies, see the remaining outsized gender, racial, and ethnic employment disparities persisting in their STEM workforces. These facts show just how much Federal scientific capacity is at risk of being lost due to scientific workforce reductions.

The departure of so much scientific talent and institutional knowledge from the government represents a competitive disadvantage for the United States. We must fix this. We can rebuild the Federal scientific workforce, but to do so, we must recommit ourselves to strengthening scientific integrity in the Federal Government and supporting career scientists.

Today's discussion will help us understand how we got here, the implications of the reduced scientific workforce, and how best to reverse these trends and restore Federal scientific capacity. I'm eager to hear from our expert witnesses, who are strong advocates for career scientists and the role of science in government. I look forward to hearing your ideas on how we can address this issue. I'm also attaching a majority staff report as part of my written statement for the record. The report has been shared with the minority and represents the majority staff view on many of the issues here.

[The prepared statement of Chairman Foster follows:]

Good morning, and thank you to all of our Members and panelists for joining us today for this Subcommittee hearing on brain drain from the federal scientific workforce. This is our first Subcommittee hearing of the 117th Congress, and I'm very pleased to return as the Chairman of the Investigations & Oversight Subcommittee to continue our important work. I'm also pleased to welcome Ranking Member Obernolte to the Subcommittee. I look forward to working together in support of America's scientific community to ensure that this country remains the global leader in science and innovation.

Today's hearing focuses on a subject close to my heart: the federal scientific workforce. The scientists of the Federal Government are a pillar in some of America's greatest achievements. Government scientists oversee grants for priority research areas, fund basic research that expands our horizons through breakthrough discoveries, and lead the way in helping to address the most pressing challenges of our time, from climate change and clean energy, to public health, to national security. Whether pushing the boundaries of scientific knowledge or informing policymaking with the best available science, government scientists perform a vital public service.

Unfortunately, recent years have been difficult for career government scientists. The last administration's hostility towards evidence-based decision-making created an awful tension with scientists attempting to carry out their duties. As violations of scientific integrity worsened and political interference escalated, scientists felt

marginalized and demoralized. Far too often, their expertise was ignored, their motives were impugned, and their work was dismissed. And this crisis arrived after years of budget constraints had already slashed their funding.

Sadly, the consequences of the failure to properly support the federal scientific workforce are clear: in critical science-based agencies and occupations, far too many scientists have recently decided to leave the Federal Government. The statistics are alarming. According to data reviewed by the Committee staff, EPA's workforce declined by 3.9% during the last administration and over 16% since 2009. DOE's civil service STEM workforce has not increased in 4 years. EPA, DOE and NOAA have all lost large numbers of STEM workers in key occupations, such as environmental protection specialists, nuclear engineers and oceanographers. Even offices with broad bipartisan support have not been spared: DOE's Office of Nuclear Energy lost over 20% of its workforce in just the first three years of the previous administration. And in many science agencies, outsized gender, racial and ethnic employment disparities persist in STEM workforces. These facts show just how much federal scientific capacity is at risk of being lost due to scientific workforce reductions.

The departure of so much scientific talent and institutional knowledge from the government represents a competitive disadvantage for the United States. We must fix this. We can rebuild the federal scientific workforce, but to do so, we must recommit ourselves to strengthening scientific integrity in the Federal Government and supporting career scientists. Today's discussion will help us to understand how we got here, the implications of a reduced scientific workforce, and how best to reverse these trends and restore federal scientific capacity. I am eager to hear from our expert witnesses, who are strong advocates for career scientists and the role of science in government. I look forward to hearing your ideas about how we can address this issue.

I now yield to Ranking Member Obernolte for his opening remarks.

Chairman FOSTER. And now I'll turn it over to my Republican colleague.

Mr. OBERNOLTE. Well, thank you very much, Chairman Foster. I am honored to serve as the Ranking Member for the Subcommittee. This Subcommittee's jurisdiction is near and dear to my heart, as you know, and I think that the subject of our hearing today is one of critical importance. We absolutely need a strong, dedicated, and talented Federal scientific workforce, and we need to make sure that we retain those people and that we recruit the best of what is coming out of our Nation's schools and universities.

I'm very much looking forward to hearing what our expert witnesses have to say. We're focusing this hearing today mostly on retention, and I think that that's of critical importance. But I'd also like to see us focus a little bit on recruitment. I think that our Federal Government needs to be entrepreneurial in our approach to getting the best talent that we can, and that means that we need to be cognizant of the fact that we're competing against not only other government agencies but against academia and against the private sector in recruiting top scientific talent for our Federal workforce, so we need to make sure that we've set the stage for success in that area.

Of particular concern to me is the fact that it takes 98 days to fully onboard a scientist into our Federal workforce right now, and compared with private sector where I come from, you know, that is shocking to me. You know, we can't be surprised that we're failing to recruit the most talented and the brightest people that are coming out of our universities when our bureaucracy is that sluggish.

So I'm looking forward to hearing from the testimony of our expert witnesses and looking forward to working with you, Mr. Chairman. I yield back.

Mr. SESSIONS. Mr. Chairman, I'd like to ask unanimous consent to speak.

Chairman FOSTER. Yes, granted.

Mr. SESSIONS. Thank you very much, and I appreciate this. I would like for us also to keep in mind that during the period of time that preceded this by a few years on a bipartisan basis Republicans and Democrats changed processes, many of them, including the NIH (National Institutes of Health) and how the NIH not only gets its money but is able to make it mandatory as opposed to discretionary and that there has been a substantial amount of time and I believe progress that at least Chairman Lucas and Mr. Perlmutter would recognize. We've not been without understanding this challenge. We have made many important things, but we also have the United States Air Force using our government techniques, and they blew up 10 Titan missiles, rockets, and we felt like we had to go to outside sources, which really—the content and the technology exists within America. It just may not be employed by the government. And as an example of that is SpaceX, which is located in Waco, Texas, which I represent. We have taken ideas from landing capsules out in the middle of the Pacific to where they land on the deck of a ship.

So, Mr. Chairman, thank you very much, but I think it's important for us to note this did not just happen. There has been a lot of work that has been bipartisan that has included a definite effort to make sure that we grew scientists and not just those that work for the government. Thank you very much. I yield back my time, sir.

Chairman FOSTER. Thank you. And I really concur with that. You know, one of the proudest bipartisan achievements particularly the last several years is that we've seen proposals to really cut the Federal scientific budget, and Republicans and Democrats have stood together to say no, that this is—these things should be preserved. And that was one of the—really the greatest bipartisan achievements of the recent past.

[The prepared statement of Chairwoman Johnson follows:]

Good morning. I would like to begin by welcoming back Chairman Foster as the Chairman of the Investigations & Oversight Subcommittee for the 117th Congress, and by welcoming Ranking Member Obernolte to the Subcommittee. I look forward to working with both of you on a vigorous oversight agenda to strengthen federal scientific research and promote the advancement of American science and technology.

The subject of today's hearing is critically important for the future of research and development in this country. Career scientists in the Federal Government are instrumental in shaping America's scientific priorities, funding cutting-edge research, and ensuring that policies are crafted on the basis of the best available science. These public servants frequently dedicate their entire careers to essential scientific functions as varied as supporting basic research, protecting clean air and water, and preparing the country for outbreaks of infectious disease. As a nation, we ignore them at our peril.

But in recent years, due to political and budgetary pressures, the federal scientific workforce has struggled. Too many career scientists have decided to leave. Fewer federal scientists means less research, slower grant processes, less mentoring for young scientists, and less specialized expertise. It means less informed policymaking and weaker regulatory enforcement. This is a problem for the agencies who employ scientists, the academic and private-sector researchers who work with them, and the American people, who benefit from their knowledge and dedication. We need to understand the implications of these staff departures for federal science agencies so that we can properly address them.

Additionally, it is imperative that we continue to promote greater diversity in the federal STEM workforce. Under my leadership, this Committee has been a strong advocate for increasing the opportunities available to women and communities of color to enter STEM professions. It is vital for the future of American science that the nation's scientific institutions encourage greater participation among historically underrepresented groups, because our strength lies in our diversity and broader perspectives lead to better science. The Federal Government must be a leader in this effort, and the federal scientific workforce must reflect the diversity of the country that it represents. Advancing diversity and inclusion will be key to revitalizing the federal scientific workforce in the years to come.

It is a longstanding priority of this Committee to strengthen the scientific capabilities of the Federal Government. A major part of those capabilities is a robust scientific workforce. We must look for ways to boost the ranks of career scientists, and to encourage scientists across the country, from all regions and backgrounds, to join the effort. I appreciate the work of our distinguished panelists in furthering this goal, and I look forward to hearing your perspectives.

Thank you. I yield back.

Chairman FOSTER. And now I'd like to introduce our witnesses. Our first witness is Ms. Candice Wright. Ms. Wright is an Acting Director of—at the GAO (Government Accountability Office) and its Science and Technology Assessment and Analytics Team. She oversees GAO's work on the management of federally funded research, intellectual property protection, and management and Federal efforts to help commercialize innovative technologies and enhance the U.S. economic competitiveness. She has also served as a congressional Detailee to the Senate Committee on Homeland Security and Government Affairs and as the head of the GAO's office in Kabul, Afghanistan. Wow. You know, people complain about being posted in Kansas City.

This—after Ms. Wright is Mr. Max Stier. Mr. Stier is President and CEO (chief executive officer) of the Partnership for Public Service, a nonprofit, nonpartisan organization dedicated to revitalizing our Federal Government—the workforce of our Federal Government by inspiring a new generation to serve. Previously, Mr. Stier worked in all three branches of the Federal Government, including a clerk for Supreme Court Justice David Souter. He is also currently a member of New York State—the New York State Spending and Government Efficiency Commission and the Brookings Institution's Public Sector Leadership Advisory Board.

Our third witness is Dr. Andrew Rosenberg. Dr. Rosenberg is the Director of the Center for Science and Democracy at the Union of Concerned Scientists (UCS). He has more than 30 years of experience in government service, as well as academic and nonprofit leadership. Dr. Rosenberg has offered peer-reviewed studies and reports on fisheries and ocean management and has published in the—on the—at the intersection between science and policymaking. He previously served as the Chief Scientist at Conservation International, the Dean of Life Sciences at the University of New Hampshire, and the Deputy Director for the U.S. National Marine Fisheries Institute.

Our final witness is Dr. Betsy Southerland. Dr. Southerland retired from her position as Director of the Office of Science and Technology in the EPA's Office of Water in 2017 following a 33-year career with the agency. While at the EPA, Dr. Southerland led the development of national regulations and guidance manuals informed by science and through the—through coordination with State environmental agencies, industry representatives, and envi-

ronmental groups. In 2015 Dr. Southerland received the Distinguished Presidential Rank Award for her career at the EPA.

And as our witnesses should know, you will each have 5 minutes for your spoken testimony. Your written testimony will be included for the hearing. And when you all have completed your spoken testimony, we will begin questions. Each Member will have 5 minutes to question the panel. And so we will start with Ms. Wright.

**TESTIMONY OF MS. CANDICE WRIGHT, ACTING DIRECTOR,
SCIENCE, TECHNOLOGY ASSESSMENT, AND ANALYTICS,
U.S. GOVERNMENT ACCOUNTABILITY OFFICE**

Ms. WRIGHT. Chairman Foster, Ranking Member Obernolte, and Members of the Subcommittee, I'm pleased to be here today to discuss the Federal science and technology workforce.

Agencies face the difficult task of keeping pace with advances in science and technology. In our prior work, GAO has seen how agencies often struggle to attract and retain a workforce that meets their needs and positions them for the future to address the complex social, economic, and security challenges facing the country, not to mention the COVID-19 pandemic. Our long-standing concerns have led us to include strategic human capital management in GAO's high-risk series since 2001.

Today, I will highlight GAO's past work that can provide insights in three key areas. First, workforce planning; second, pay and hiring authorities; and third, the Federal work environment. With regard to the first area, strengthening human capital management, particularly for agencies with science and technology missions, can help them build a highly diverse, highly qualified and agile workforce. To successfully implement their missions, agencies need to identify current skill gaps and future needs in the workforce. They also need to select the right human capital strategies to fill them.

However, our prior work has identified workforce strategic planning challenges that agencies have not fully addressed. In October 2019 we found that 18 of the 24 agencies we reviewed had not fully implemented certain key workforce activities such as establishing a workforce planning process or developing strategies to address gaps in staffing. We recommended agencies such as the National Science Foundation (NSF) fully implement these activities, but not all agencies have done so.

We've also reported on NSF's use of rotators, who are outside scientists and engineers on temporary assignment. We made two recommendations aimed at improving NSF workforce strategy for balancing its use of rotators with permanent staff.

On the second area, improving Federal pay and hiring can help agencies compete with employers in other sectors. Agencies can tap an array of incentives when they need to recruit or retain experts in fields such as cybersecurity, engineering, or in other high-demand fields. Special payment authorities allow agencies to pay higher wages, help pay off student loans, and provide other incentives. In December 2017 we reported that fewer than 6 percent of employees at 27 agencies reviewed received special payments. Agencies reported that incentives were helpful, but the extent of impacts was not known, and the Office of Personnel Management (OPM) has not assessed how the authorities help improve recruit-

ment and retention. Similarly, agencies have multiple hiring authorities but afford flexibility in the hiring process.

In August 2016 we reported on 105 hiring authorities. Among the most used authorities was direct hire, which allows agencies to fill positions that have a severe candidate shortage or a critical need such as for STEM personnel. OPM and agencies have not analyze the effectiveness of such hiring authorities. GAO made six recommendations to OPM to assess and improve the use of pay and hiring authorities, and OPM is in varying stages of implementation.

For the third area, our work has identified several factors that, if left unaddressed, may negatively influence agencies' ability to attract, hire, and retain a diverse, highly skilled science and technology workforce. For example, we reported last year that individuals who experience sexual harassment at work are more likely to leave their jobs. We've made recommendations to agencies to improve implementation of their policies and procedures to prevent and address sexual harassment both in their own workforce and also at the university level as Federal research grant recipients can be important part of the pipeline for the future Federal workforce.

In April 2019 we reported that while selected agencies we reviewed had taken various actions to help achieve the objectives of their scientific integrity policies, additional actions were needed. Here, we made 10 recommendations to six agencies to address various issues, including developing procedures to identify and address scientific integrity policy violations.

In closing, science and technology is integral to how agencies execute their mission. The Federal Government's success in attracting, hiring, and retaining a world-class science and technology workforce is tied to how it effectively and strategically utilizes the wide range of available authorities and other resources. As science and technology continues to rapidly evolve, so too must the government's recruitment and retention efforts. How the government responds or doesn't to face its human capital challenges today will have lasting effects for the future workforce it needs.

Chairman Foster, Ranking Member Obernolte, and Members of the Subcommittee, this concludes my statement. I would be pleased to respond to any questions you may have.

[The prepared statement of Ms. Wright follows:]



United States Government Accountability Office

Testimony
Before the Subcommittee on
Investigations and Oversight,
Committee on Science, Space, and
Technology, House of Representatives

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SCIENCE AND TECHNOLOGY

Strengthening and Sustaining the Federal Science and Technology Workforce

Statement of Candice N. Wright, Acting Director,
Science, Technology Assessment, and Analytics



GAO@100 Highlights

Highlights of GAO-21-461T, a testimony before the Subcommittee on Investigations and Oversight, Committee on Science, Space, and Technology, House of Representatives

Why GAO Did This Study

The federal workforce is critical to agencies' ability to address the complex social, economic, and security challenges facing the United States. However, across government, mission critical skill gaps are undermining the ability of federal agencies to carry out their missions. Federal agencies face the difficult task of staying apace of advances in science and technology while competing for talent with the private sector, universities, and non-profit research centers. GAO has had long-standing concerns about federal agencies' strategic human capital management, an issue highlighted in GAO's High Risk Series since 2001.

This testimony summarizes GAO's insights based on a wide range of GAO work covering various human capital management- and science and technology-related issues from March 2015 through February 2021. In particular, the statement focuses on (1) workforce planning to help ensure agencies are better positioned to implement their missions; (2) opportunities and challenges to recruiting a diverse, high-qualified science and technology workforce; and (3) factors that can affect the work environment.

For this testimony, GAO selected prior work across human capital management- and science and technology-related topics.

What GAO Recommends

GAO has made numerous recommendations to address human capital management and other issues covered in this testimony. Federal agencies have implemented some of these recommendations, but have not fully implemented others.

View GAO-21-461T. For more information, contact Candice N. Wright, 202-512-6888, WrightCN@gao.gov

March 17, 2021

SCIENCE AND TECHNOLOGY

Strengthening and Sustaining the Federal Science and Technology Workforce

What GAO Found

Strengthening human capital management at federal agencies, particularly those with science and technology missions, can help agencies build a diverse, highly qualified, and agile workforce. GAO's past work demonstrates three key areas for strengthening and sustaining the federal science and technology workforce.

Strategic workforce planning to identify gaps and future needs. To successfully implement their missions, agencies need to identify current skill gaps and future needs in their workforce, and select the right human capital strategies to address them. However, GAO's prior work has identified science and technology workforce strategic planning challenges that agencies have not fully addressed. For example, in October 2019, GAO evaluated major agencies' implementation of cybersecurity workforce planning strategies for information technology (IT) workers. GAO found that most of the 24 federal agencies had not fully implemented five of the eight key workforce activities that GAO identified because of reasons such as competing priorities and limited resources. GAO recommended that the 18 agencies fully implement the eight key IT workforce planning activities. Thirteen agencies agreed with the recommendation, while the other five expressed a range of views; however, while some agencies have made progress, none have fully implemented the recommendation.

Improving federal pay and hiring. Agencies may experience challenges in recruiting and retaining a diverse, highly-qualified workforce due to differences in pay compared to private sector employers and challenges related to the hiring process. Generally, federal agencies have seven broadly available government-wide special payment authorities to help address recruitment and retention challenges. In December 2017, GAO reported that the Office of Personnel Management (OPM) collects data on use of these authorities but had not analyzed how much the authorities help improve recruitment and retention. GAO also reported that the agency may be missing opportunities to promote strategic use of these authorities by providing guidance and tools on assessing effectiveness. Similarly, in August 2016, GAO reported that OPM and hiring agencies had not used hiring data to analyze the effectiveness of hiring authorities. Across these reports, GAO made six recommendations to assess and improve the use of pay and hiring authorities. OPM generally agreed with GAO's recommendations, and has implemented two of the six recommendations, but has not fully implemented the other four.

Addressing factors that affect the federal work environment. Factors affecting the working environment may also influence agencies' ability to attract, hire, and retain personnel. For example, GAO reported in September 2020 that individuals who experience sexual harassment are more likely to leave their jobs. Also, in March 2015, GAO reported that impediments to interacting with non-federal scientific peers because, for example, of restrictions on conference participation can be a disincentive to federal employment. Agency officials told GAO that scientists and engineers establish their professional reputations by presenting research at conferences to have their work published and, without such opportunities, researchers may find federal employment less desirable. Addressing such factors could help agencies build and sustain a diverse, highly-skilled science and technology workforce.

United States Government Accountability Office

Chairman Foster, Ranking Member Obernolte, and Members of the Subcommittee:

Thank you for the opportunity to contribute to today's discussion of the science and technology workforce. The federal workforce is critical to agencies' ability to address the complex social, economic, and security challenges facing the country. However, across government, critical skill gaps are undermining the ability of federal agencies to carry out their missions. In GAO's prior work, we have seen how agencies often struggle to attract and retain a workforce that meets their agency's needs and positions them for the future.

My remarks today focus on what we have found in our prior work on (1) workforce planning to help ensure agencies are better positioned to implement their missions; (2) opportunities and challenges to recruiting a diverse, highly qualified science and technology workforce; and (3) factors that can affect the work environment.

This testimony is based on our body of work on federal human capital management and selected science and technology reports issued primarily between March 2015 and February 2021. More detailed information on the objectives, scope, and methodology for that work can be found in the issued reports.

We conducted the work on which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Since 2001, GAO has included strategic human capital management on its High Risk list.¹ Without such management, agencies may not have the staff with the necessary knowledge, skills, and abilities to support their missions and goals. Agency efforts to identify skill gaps and future needs in the expertise of their scientific and technical staff through strategic workforce planning can help ensure they are better positioned to

¹The GAO High Risk list contains programs and operations that are 'high risk' due to their vulnerabilities to fraud, waste, abuse, and mismanagement, or that need transformation. The list is issued every 2 years at the start of each new session of Congress. <https://www.gao.gov/high-risk-list>

implement their missions. In light of trends and other challenges facing the government's human capital management efforts, our prior work has identified actionable strategies that agencies may be able to use to effectively manage the future federal workforce in key talent management areas (see table 1).

Table 1: Key Strategies and Practices for Managing the Current and Future Federal Workforce

Function	Strategy	Practice
Align human capital strategy with current and future mission requirements	Set workforce goals and assess skills and competencies needed to achieve them	Identify existing skills and competencies
		Assess gaps in existing and future skills and competencies
		Monitor progress toward closing skills gaps
Acquire and assign talent	Source and recruit talent	Cultivate a diverse talent pipeline
		Highlight agency mission
		Recruit continuously and start the hiring process early in the school year
		Strategically leverage available hiring flexibilities
	Assess and screen candidates	Write user-friendly vacancy announcements
		Use relevant assessment methods and share hiring lists
Incentivize and compensate employees	Assign employees where needed	Improve the security clearance process
		Develop a culture of agility
	Leverage benefits and incentives	Increase awareness of benefits and incentives, such as work-life programs
		Tailor benefits and incentives to employees' needs
		Address barriers to telework
Engage employees	Leverage existing pay authorities	Use special payment authorities strategically
		Improve selection and training of supervisors and managers
	Manage employee performance and create a "line of sight" between individual performance and organizational results	Link agency's mission and employees' work
		Implement meaningful rewards programs
	Involve employees in decisions	Share innovative approaches to performance
	Develop employees	Increase support for an inclusive work environment
		Prioritize training for employees and managers
		Encourage details, rotations, and other mobility opportunities

Source: GAO-19-181. | GAO-21-461T

Strengthening and Sustaining the Federal Science and Technology Workforce

Strengthening human capital management at federal agencies, particularly those with science and technology missions, can help agencies build a diverse, highly-qualified, and agile workforce. Our past work and recommendations demonstrate three key areas for building the science and technology workforce: strategic workforce planning to identify skill gaps and future needs; improving federal pay and hiring; and addressing factors that affect the federal work environment.

Strategic Workforce Planning to Identify Gaps and Future Needs

Federal agencies face the difficult task of staying apace of advances in science and technology while competing for talent with the private sector, universities, and non-profit research centers. In our prior work, we reported that high-performing organizations define what they want to accomplish and what kind of organization they want to be.² They then identify and analyze the personnel skills, competencies, number of positions, and other factors needed to achieve those objectives.³ Identifying the skills needed to achieve their mission and to close any gaps in their current workforce helps agencies to select the right human capital strategies to address those needs. However, these steps are a challenge for agencies that lack the capacity for, or commitment to, strategic workforce planning.

Thoughtful workforce planning efforts can lead to concrete benefits to agencies' ability to achieve their missions. For example, in May 2015, we recommended that the U.S. Department of Agriculture (USDA) assess and address veterinarian workforce needs for emergency response to an animal disease outbreak.⁴ USDA implemented this recommendation by, among other things, analyzing its response to the 2015 avian influenza outbreak and completing an analysis of simulated outbreaks of foot-and-mouth disease and estimates of veterinarian surge demand for responding to the outbreaks. These efforts increase confidence that USDA will be well-positioned to respond to any future zoonotic disease outbreaks.

²GAO, *Human Capital: A Self-Assessment Checklist for Agency Leaders*, [GAO/OCG-00-14G](#) (Washington, D.C.: Sept. 1, 2000).

³GAO, *Human Capital: Strategies to Help Agencies Meet Their Missions in an Era of Highly Constrained Resources*, [GAO-14-168](#) (Washington, D.C.: May 7, 2014).

⁴GAO, *Federal Veterinarians: Efforts Needed to Improve Workforce Planning*, [GAO-15-495](#) (Washington, D.C.: May 26, 2015).

However, we have found a number of instances where agencies faced strategic workforce planning challenges related to science and technology that have not yet been fully addressed.

- In October 2019, our evaluation of major agencies' implementation of cybersecurity workforce planning strategies for information technology (IT) workers found that 23 of 24 Chief Financial Officer Act agencies had at least partially implemented three of eight key workforce planning activities, including identifying staffing needs and assessing gaps. However, most agencies minimally implemented or had not implemented five other workforce planning activities, including developing strategies to address those gaps.⁵ Agencies provided various reasons for their limited progress in implementing workforce planning activities, including competing priorities and limited resources. We made a recommendation to 18 of the 24 federal agencies to fully implement the eight key IT workforce planning activities. Thirteen agencies agreed with the recommendation, while the other five expressed a range of views. Some agencies have made progress implementing the recommendation; however, as of March 2021, all of the recommendations remain open pending agency actions to fully implement them.
- In March 2019, we reported that most of the 24 Chief Financial Officer Act agencies had likely miscategorized the work roles of many IT and cybersecurity positions.⁶ For example, at least 22 of the 24 agencies designated positions as not performing IT, cybersecurity, or cyber-related functions, when they did most likely perform these functions. By assigning work roles that are inconsistent with the IT, cybersecurity, and cyber-related positions, the agencies were diminishing the reliability of the information they need to improve workforce planning. We made 28 recommendations to 22 agencies to address these issues, and the majority of the agencies agreed with the recommendations. As of March 2021, 8 of our 28 recommendations from this review had not been implemented.
- At the National Science Foundation (NSF) we recently made two recommendations related to identifying and closing skills gaps.

⁵GAO, *Information Technology: Agencies Need to Fully Implement Key Workforce Planning Activities*, GAO-20-129 (Washington, D.C.: Oct. 30, 2019).

⁶GAO, *Cybersecurity Workforce: Agencies Need to Accurately Categorize Positions to Effectively Identify Critical Staffing Needs*, GAO-19-144 (Washington, D.C.: Mar. 12, 2019).

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- In September 2018, we reported on NSF's use of rotators—outside scientists, engineers, and educators on temporary assignment—and recommended that NSF complete development of an agency-wide workforce strategy for balancing the agency's use of rotators with permanent staff.⁷ Completing the strategy would help the agency determine what skills and competencies are critical to its mission and how to address any gaps. NSF agreed with this recommendation and in November 2018 indicated it had plans to do so, but as of March 2020 NSF had not completed the strategy.
 - In March 2019, we recommended that NSF evaluate the project management competencies of staff overseeing major research facilities projects, such as NSF's contributions to upgrades of the Large Hadron Collider.⁸ NSF agreed with the recommendation and since that time has secured a contractor to help evaluate its competencies and training.
 - In July 2018 we found that, to fulfill its mission to promote U.S. innovation and industrial competitiveness, the National Institute of Standards and Technology (NIST) relies on the expertise and research of its staff, and that it is challenging for the agency to stay abreast of the breadth of U.S. industry and research.⁹ NIST's primary method for assessing industry and other stakeholders' needs for NIST's measurement services and standards development efforts is through outreach by individual technical staff and their expertise in relevant disciplines and related industries. We recommended that NIST comprehensively assess the measurement needs of its stakeholders, which would allow the agency to then identify and analyze the personnel skills, competencies, numbers, and other factors needed to achieve those objectives. NIST agreed with this recommendation and had taken some steps to implement it, but, as of May 2020, had not fully implemented the recommendation.

⁷GAO, *National Science Foundation: A Workforce Strategy and Evaluation of Results Could Improve Use of Rotating Scientists, Engineers, and Educators*, [GAO-18-533](#) (Washington, D.C.: Sept. 5, 2018).

⁸GAO, *National Science Foundation: Cost and Schedule Performance of Large Facilities Construction Projects and Opportunities to Improve Project Management*, [GAO-19-227](#) (Washington, D.C.: Mar. 27, 2019).

⁹GAO, *National Institute of Standards and Technology: Additional Review and Coordination Could Help Meet Measurement Service Needs and Strengthen Standards Activities*, [GAO-18-445](#) (Washington, D.C.: Jul. 26, 2018).

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- In April 2017, we recommended that the Nuclear Regulatory Commission (NRC) set agency-wide goals for overall workforce size and skills composition that extend beyond the 2-year budget cycle to improve NRC's ability to strategically manage the size and composition of its workforce and respond to changes in the nuclear industry.¹⁰ Since then, NRC completed a workforce planning pilot project and now forecasts its workload over a 5-year time frame. However, NRC does not establish specific goals for the size of the workforce beyond the 2-year budget cycle as part of the process. As of September 2020, NRC officials said they do not plan to do so due to concerns about their ability to do so with a sufficient level of accuracy.
 - In February 2021, we reported that Department of Energy (DOE) laboratory researchers we spoke with who participated in entrepreneurship and commercialization training, such as its Energy I-Corps program, said that it greatly helped them communicate with potential customers, understand industry priorities, and consider how technologies could solve real-world issues.¹¹ Agencies can use career developmental opportunities, including training, to (1) help their workforce develop skills to meet evolving mission requirements, (2) ensure managers are well qualified, and (3) appeal to current and future workers' desires for career mobility. However, the department had not conducted an assessment of researchers' entrepreneurship skills and competencies. Understanding the research, business, and entrepreneurial skills of DOE researchers may allow the department to better meet industry needs and increase technology commercialization. We recommended that DOE assess researchers' skills to support technology transfer efforts and provide training to address any skills gaps—DOE agreed with this recommendation.

Improving Federal Pay and Hiring

We have found in our prior work that agencies may experience challenges recruiting and retaining a diverse, highly-qualified scientific and technical workforce due to differences in pay compared to private sector employers and challenges related to the hiring process.

¹⁰GAO, *Strategic Human Capital Management: NRC Could Better Manage the Size and Composition of Its Workforce by Further Incorporating Leading Practices*, [GAO-17-233](#) (Washington, D.C.: Apr. 27, 2017).

¹¹GAO, *Department of Energy: Improved Performance Planning Could Strengthen Technology Transfer*, [GAO-21-202](#) (Washington, D.C.: Feb. 1, 2021).

Pay

Generally, federal agencies have seven broadly available government-wide special payment authorities to help address recruitment and retention challenges related to pay. In December 2017, we reported that fewer than 6 percent of the over 2 million employees at 27 agencies with Chief Human Capital Officers received compensation from at least one of the authorities in fiscal year 2016.¹² Some of these authorities target employees with science and technology skills. The two most frequently used—special rates and retention incentives—were used for over 74,000 employees and over 13,000 employees, respectively.¹³ The least-used—critical position pay—was used for as few as seven employees a year.¹⁴ The other authorities are recruitment incentives, relocation incentives, student loan repayments, and superior qualification and special needs pay setting.¹⁵

In our December 2017 report, we found that the Office of Personnel Management (OPM) collects data on use of these authorities but had not analyzed how much the authorities help agencies improve recruitment and retention government-wide.¹⁶ We also found that OPM may be missing opportunities to promote strategic use of these authorities by providing guidance and tools to assess effectiveness, and that OPM had not established documented procedures to assess and potentially streamline reviews of agency requests to use these authorities. We made three recommendations to address these issues, with which OPM agreed, or partially agreed. As of June 2020, OPM had taken some steps to

¹²GAO, *Federal Pay: Opportunities Exist to Enhance Strategic Use of Special Payments*, GAO-18-91 (Washington, D.C.: Dec. 7, 2017).

¹³Special rates may apply to an occupation or group of occupations to address significant handicaps in recruiting and retaining employees. Retention incentives may be paid to a current employee, group, or category of employees if the agency determines that the unusually high or unique qualifications of the employee or a special need of the agency for the employee's services makes it essential to retain the employee and the employee is likely to leave federal service in the absence of such an incentive.

¹⁴Critical position pay permits an agency to set a higher rate of basic pay for a position that requires expertise of an extremely high level in a scientific, technical, professional, or administrative field and is critical to the successful accomplishment of an important mission.

¹⁵Superior qualification and special needs pay setting allows an agency to set the rate of basic pay of a newly-appointed employee at a rate above the minimum rate of the appropriate General Schedule (GS) grade because of the superior qualifications of the candidate, or a special need of the agency for the candidate's services.

¹⁶GAO-18-91.

implement these recommendations but had not fully implemented any of them.

Additionally, our prior work has addressed use of these authorities at some agencies and use of some additional pay authorities that are limited to individual agencies.

- In August 2018, we found that the National Institutes of Health's (NIH) loan repayment program—which includes scientists at NIH and extramural scientists at universities or other research institutions—may help attract, retain, and develop scientists from underrepresented groups.¹⁷ Further, the 21st Century Cures Act included new authorities for NIH to expand its loan repayment program by increasing the eligible annual loan repayment amount from a maximum of \$35,000 to \$50,000 and giving the NIH Director discretion to amend eligibility based on emerging scientific priorities or workforce needs. At the time of our review in 2018, NIH had not yet implemented this expansion.
- In September 2016, we found that the Department of the Interior had begun to use special salary rates to give higher pay to certain key staff in its three bureaus that oversee oil and gas resources and some bureaus increased the number of staff receiving student loan repayments and other incentives.¹⁸ We recommended that Interior regularly evaluate the effectiveness of its available incentives in hiring and retaining key oil and gas staff. To implement this recommendation, in November 2019, Interior officials provided a summary of their evaluation of workforce data from fiscal years 2016 through 2018. Interior's summary concluded that the three bureaus had experienced an aggregate gain in their key oil and gas staff and officials attributed this gain to use of special salary rates.
- In May 2020, we reported that the Department of Health and Human Services (HHS) issued regulations but had not yet begun to use new authorities for recruiting and retaining biomedical research scientists.¹⁹ The authorities include changes to the Senior Biomedical

¹⁷GAO, *NIH Research: Action Needed to Ensure Workforce Diversity Strategic Goals Are Achieved*, [GAO-18-545](#) (Washington, D.C.: Aug. 10, 2018).

¹⁸GAO, *Oil and Gas Oversight: Interior Has Taken Steps to Address Staff Hiring, Retention, and Training but Needs a More Evaluative and Collaborative Approach*, [GAO-16-742](#) (Washington, D.C.: Sept. 29, 2016).

¹⁹GAO, *Biomedical Research: HHS Has Not Yet Used New Authorities to Improve Recruitment and Retention of Scientists*, [GAO-20-531R](#) (Washington, D.C.: May 8, 2020).

	<p>Research Service, which allow for pay of up to the President's salary (currently \$400,000 per year) for up to 2,000 research service members. HHS officials said that the HHS agencies that are expected to use the research service authorities for recruitment and retention are NIH, Food and Drug Administration, the Centers for Disease Control and Prevention, and the Agency for Healthcare Research and Quality. At the time of our review, HHS needed to distribute the 2,000 member cap among the agencies before it could select members.</p>
Hiring Authorities	<p>In our prior work we found that to acquire needed talent, agencies need a hiring process that is applicant-friendly, flexible, and meets policy requirements, such as hiring on the basis of merit, among other things.²⁰ Agencies have flexibility in what authorities they use to fill positions, some of which apply specifically to science and technology positions. A hiring authority is the law, executive order, or regulation that allows an agency to hire a person into the federal civil service. Amongst other roles, hiring authorities determine the rules that agencies must follow throughout the hiring process. These rules may include whether a vacancy must be announced, who is eligible to apply, how the applicant will be assessed, whether veterans' preference applies, and how long the employee may stay in federal service.</p> <p>In August 2016, we reported on the 105 hiring authorities used to make nearly 200,000 appointments in fiscal year 2014.²¹ Among the most used authorities were direct-hire authority, which allows agencies to fill positions OPM has determined have a severe candidate shortage or a critical hiring need—including science, technology, engineering, and mathematics personnel—and authority allowing Department of Defense (DOD) to hire science and technology personnel at defense research labs.</p> <p>However, we found that while OPM—the agency responsible for overseeing the delegated hiring authority and managing federal civilian personnel data—tracks data on agency time-to-hire, manager and applicant survey results, and compliance audits to assess the hiring process, this information is not used by OPM or agencies to analyze the</p>

²⁰OPM is responsible for ensuring that the personnel management functions it delegates to agencies are conducted in accordance with merit principles, and the standards established by OPM for conducting those functions. 5 U.S.C. § 1104(b).

²¹GAO, *Federal Hiring: OPM Needs to Improve Management and Oversight of Hiring Authorities*, GAO-16-521 (Washington, D.C.: Aug. 2, 2016).

effectiveness of hiring authorities. We recommended, among other things, that OPM should use this information to determine whether opportunities exist to refine, consolidate, eliminate, or expand agency-specific authorities to other agencies and develop legislative proposals for changes or implement them where allowed.²² While OPM agreed with this recommendation and the agency has made some progress, we believe it will be important for the agency to prioritize and follow through on its planned actions to streamline hiring authorities. Expanding access to hiring authorities found to be highly efficient and effective while eliminating those found to be less effective would help simplify and improve the federal hiring process.

We have also reported on the use of these authorities in some science and technology agencies:

- In May 2018, we reported on hiring efforts at the defense labs and found the labs had used the laboratory-specific direct hire authorities more than any other category of agency-specific or government-wide hiring authority for science, technology, engineering, and mathematics personnel.²³ Lab officials, however, identified challenges to hiring highly qualified candidates, such as delays in processing security clearances, despite the use of additional hiring authorities. We made three recommendations, including that DOD should develop performance measures to evaluate the effectiveness of the defense laboratories hiring authorities. DOD agreed with our recommendations, but they remain open as of March 2021.
- In May 2015, we reported that OPM granted government-wide direct-hire authority in 2009 to enable agencies to hire qualified veterinarians without regard to certain federal hiring requirements.²⁴ We recommended OPM evaluate whether the need for government-wide direct-hire authority for veterinarians continued to exist and OPM completed an evaluation in June 2017. According to OPM's summary, the evaluation suggested that the government-wide direct-hire authority should remain active.

²²OPM implemented our other two recommendations regarding studying the use of hiring authorities and providing information, tools, and support to agencies.

²³GAO, *DOD Personnel: Further Actions Needed to Strengthen Oversight and Coordination of Defense Laboratories Hiring Efforts*, [GAO-18-417](#) (Washington, D.C.: May 30, 2018).

²⁴[GAO-15-495](#).

USAJOBS

We have also reported on efforts to enhance USAJOBS, the central website for posting federal job openings. In October 2020, we reported that various factors, such as unclear application processes and long wait times for job offers, had been identified as contributing to the federal government's workforce deficiencies in certain areas and job categories.²⁵ We found that since the agency's redesign of USAJOBS in 2016, OPM has taken a number of actions in an effort to address feedback and improve the USAJOBS user experience. For example, in 2021 OPM officials expected to begin providing information on job status for each posting, such information would include the number of applicants and when the job has been filled.

Addressing Factors that
Affect the Federal Work
Environment

In our March 2019 federal workforce report, we found that, according to experts, employees are seeking greater developmental opportunities and would prefer longer-term employment where they can continue to build their skills.²⁶ While federal agencies offer unique opportunities to pursue meaningful work, achieve autonomy, and have a healthy work-life balance, experts also highlighted key challenges regarding perceptions surrounding federal work from the potential applicants. These challenges include perceptions that the federal work is too bureaucratic, lacks innovation and involves maintaining the status quo, is less prestigious than the private sector, and makes it difficult to see the immediate effect of their work. In addition, in our prior work on science and technology issues, we identified several factors that can negatively affect the working environment of federal scientific and technical staff. Taking steps to address these factors can help agencies sustain the expertise needed to achieve their missions. Such factors include:

- **Sexual harassment.** In a September 2020 report, we found that there is limited nationwide data to help comprehensively understand the prevalence and costs of workplace sexual harassment.²⁷ However, one study we reported on found that 63 percent of women working in science, engineering, and technology—historically male-dominated

²⁵GAO, *USAJOBS Website: OPM Has Taken Actions to Assess and Enhance the User Experience*, [GAO-21-31](#) (Washington, D.C.: Oct. 13, 2020).

²⁶GAO, *Federal Workforce: Key Talent Management Strategies for Agencies to Better Meet Their Missions*, [GAO-19-181](#) (Washington, D.C.: Mar. 28, 2019).

²⁷GAO, *Workplace Sexual Harassment: Experts Suggest Expanding Data Collection to Improve Understanding of Prevalence and Costs*, [GAO-20-564](#) (Washington, D.C.: Sept. 30, 2020).

fields—said they experienced sexual harassment.²⁸ We also reported that individuals who experience sexual harassment are more likely to subsequently leave their jobs. We have also reported recently on steps federal agencies can take to address sexual harassment both in their own workforce and at academic institutions that receive federal research funding, as these institutions serve as a pipeline for future federal scientists. In April 2020, we identified several opportunities for the Smithsonian Institution to strengthen its policies and procedures to respond to allegations of sexual harassment by, for example, developing written guidance for supervisors on how to address complaints and establishing a tracking mechanism to monitor complaints filed.²⁹ More broadly, in March 2020, we found that agencies have taken action, but need complaint procedures, overall plans, and better coordination to address sexual harassment faced by university researchers in science, technology, engineering, and mathematics.³⁰ We provided 17 recommendations to five different agencies to address these issues, many of which remain open pending agency action.

- **Diversity and underrepresented groups.** In August 2018, we evaluated NIH's efforts to support investigators from racial and ethnic groups considered by NIH to be underrepresented in biomedical research.³¹ Although this work addressed extramural grantees, it speaks to the pipeline of scientific talent agencies draw from. Our analysis showed disparities for underrepresented racial and ethnic groups, and for female investigators, from 2013 through 2017. For example, in 2017, about 17 percent of investigators from underrepresented racial groups—African Americans, American Indians/Alaska Natives, and Native Hawaiian/Pacific Islanders combined—who applied for large grants received them. In contrast,

²⁸Sylvia Ann Hewlett, et al., "The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology," Harvard Business Review (Boston, Mass.: 2008).

²⁹GAO, *Sexual Harassment Policies: Smithsonian Has Procedures for Prevention, but Could Improve Guidance and Monitoring*, [GAO-20-414R](#) (Washington, D.C.: Apr. 9, 2020).

³⁰GAO, *Sexual Harassment in STEM Research: Agencies Have Taken Actions, but Need Complaint Procedures, Overall Plans, and Better Collaboration*, [GAO-20-187](#) (Washington, D.C.: Mar. 19, 2020). This report includes further detail on preliminary observations we provided in testimony before the House Science, Space, and Technology Committee in June 2019. GAO, *Sexual Harassment in STEM Research: Preliminary Observations on Policies for University Grantees and Information Sharing among Selected Agencies*, [GAO-19-583T](#) (Washington D.C.: June 12, 2019).

³¹[GAO-18-545](#).

about 24 percent of Hispanic or Latino applicants, an underrepresented ethnic group, received such grants. Asians and whites are not considered to be underrepresented in biomedical science research—and were successful in receiving large grants about 24 and 27 percent of the time, respectively.

- **Limitations on engagement with peers.** In a March 2015 report, we reviewed DOD and DOE implementation of Office of Management and Budget requirements to establish senior-level review of conference attendance.³² Following agency implementation of conference approval policies, attendance at science and technology conferences declined according to DOD and DOE officials; although the officials cited other contributing factors such as mandated travel reductions and sequestration. DOD and DOE officials identified several risks to achieving their agencies' science and technology missions associated with changes in conference participation, including difficulty in recruiting and retaining qualified scientists and engineers. For example, Naval Research Laboratory officials said that conference attendance constraints were cited in exit interviews as a contributing factor in nine staff resignations. Also, DOD and DOE officials told us that scientists and engineers establish their professional reputations by presenting research at conferences in order to have their work published. Without such opportunities, officials said that researchers may not be attracted to employment or continued employment at a federal lab as a means of accomplishing their professional objectives.³³ To help manage such risks, we recommended that DOD and DOE, among other things, develop a plan to analyze and periodically reevaluate the risks from changes in participation at science and technology conferences on their ability to meet their scientific missions. Officials at the DOD and DOE cited improvements to their conference approval guidance and processes

³²GAO, *Defense Science and Technology: Further DOD and DOE Actions Needed to Provide Timely Conference Decisions and Analyze Risks from Changes in Participation*, [GAO-15-278](#) (Washington, D.C.: Mar. 4, 2015).

³³These concerns echoed an August 2013, Office of Science and Technology Policy memorandum which stated that reductions in the ability of federal scientists and engineers to attend science and technology conferences would, if continued, encourage the best scientists and engineers to leave federal service—ultimately degrading the overall quality of the workforce and its research, and diminishing the capabilities of the federal labs. National Science and Technology Council, *Implementation of Federal Travel and Conference Policies with Respect to Scientific and Technical Conferences*, Memorandum for National Science and Technology Council Committees and Subcommittees (Aug. 5, 2013). The Office of Science and Technology Policy provides administrative support to the National Science and Technology Council.

respectively as sufficient and told us such plans were unnecessary. We disagreed, but DOD and DOE have not taken additional action to implement our recommendation.

- Scientific integrity issues.** In an April 2019 report, we reviewed agencies' scientific integrity policies and actions agencies have taken to implement them.³⁴ According to guidance the Office of Science and Technology Policy issued in 2010 and reaffirmed in a 2021 Presidential memorandum, agencies' scientific integrity policies should, among other things, ensure a culture of scientific integrity and political appointees should not suppress or alter scientific or technological findings.³⁵ Robust agency implementation of sound scientific integrity policies can help to assure the public of the integrity of federally funded science that informs public policy decisions. It may also help to ensure that scientific integrity issues do not negatively affect the federal workforce. The potential for this was raised in the 2021 presidential memo, which directed the convening of an interagency task force on scientific integrity that will evaluate whether deviations from existing scientific integrity policies led to suppression or distortion of scientific findings or disproportionately harmed federal scientists and researchers from groups that are historically underrepresented, among other things. Our April 2019 report found that, while the selected agencies we reviewed had taken various actions to help achieve the objectives of their scientific integrity policies, additional actions could strengthen the integrity of federal research.³⁶ Specifically, we made 10 recommendations to six agencies to address issues related to educating staff, providing oversight, monitoring and evaluating policy implementation, and developing procedures to identify and address policy violations. Nine of these recommendations remain open pending agency action.

³⁴GAO, *Scientific Integrity Policies: Additional Actions Could Strengthen Integrity of Federal Research*, [GAO-19-265](#) (Washington, D.C.: Apr. 4, 2019). This report was summarized in testimony we provided before the House Science, Space, and Technology Committee's Subcommittees on Research and Technology and Investigations and Oversight in July 2019. GAO, *Federal Research: Agency Actions Could Strengthen Scientific Integrity Policies*, [GAO-19-674T](#) (Washington D.C.: July 17, 2019).

³⁵Office of Science and Technology Policy, *Scientific Integrity*, Memorandum for the Heads of Executive Departments and Agencies, (Dec. 17, 2010). In addition, in January 2021, President Biden issued a memorandum reaffirming and building upon the 2010 memo. Presidential Action Memorandum of Jan. 27, 2021, *Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking*, 86 Fed. Reg. 8845 (Feb. 10, 2021).

³⁶[GAO-19-265](#).

In conclusion, our prior work shows that federal agencies face significant challenges in their human capital management. Concerted efforts are needed to identify skill and competency gaps at agencies prior to choosing the right strategies for filling those gaps. Agencies also need to ensure that they build an inclusive and supportive workplace that attracts and retains talent.

Chairman Foster, Ranking Member Obernolte, and Members of the Subcommittee, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

Related GAO Products

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Workplace Sexual Harassment: Experts Suggest Expanding Data Collection to Improve Understanding of Prevalence and Costs, [GAO-20-564](#). Washington, D.C.: Sept. 30, 2020.

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Federal Hiring: OPM Needs to Improve Management and Oversight of Hiring Authorities, [GAO-16-521](#). Washington, D.C.: August 2, 2016.

Federal Veterinarians: Efforts Needed to Improve Workforce Planning, [GAO-15-495](#). Washington, D.C.: May 26, 2015.

Defense Science and Technology: Further DOD and DOE Actions Needed to Provide Timely Conference Decisions and Analyze Risks from Changes in Participation, [GAO-15-278](#). Washington, D.C.: March 4, 2015.

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Candice N. Wright

Candice Wright is an Acting Director at the Government Accountability Office (GAO) in its Science, Technology Assessment, and Analytics team. She oversees GAO's work on the management of federally funded research, intellectual property protection and management, and federal efforts to help commercialize innovative technologies and enhance U.S. economic competitiveness.

Ms. Wright joined GAO in July 2004. She has led reviews on a wide variety of policy issues involving federal contracting, risks to the defense supplier base, foreign military sales, and homeland security. In 2011, she served on a congressional detail to the U.S. Senate Committee on Homeland Security and Governmental Affairs, Permanent Subcommittee on Investigations. Ms. Wright also served as the head of GAO's office in Kabul, Afghanistan in 2014.

Prior to joining GAO, Ms. Wright worked in the private sector in a variety of human capital consulting roles. She earned a master's degree in public policy from Carnegie Mellon University, and a bachelor's degree in management from Bentley College.

Chairman FOSTER. Thank you very much for that. And thank you for all the work that you and the GAO does, you know, every year for us.

So reading over your written testimony earlier reminded me of how important it is to have you around for—to lengthen the attention span of the U.S. Congress.

And so next is Mr. Stier.

**TESTIMONY OF MR. MAX STIER, PRESIDENT AND CEO,
PARTNERSHIP FOR PUBLIC SERVICE**

Mr. STIER. Thank you, Chairman Foster and Ranking Member Obernolte and all the Members of the Subcommittee. It is tremendous to see the bipartisan approach that you've taken to such a vital issue. Your Committee staff has done an exceptional job at laying out the problem, and I thought I would take my time to talk about why the problem exists and offering a few recommendations about what you can do about it.

Starting with why the problem exists, if we don't understand that in the right way, we'll never solve it. And there are five big reasons that I would focus on in terms of the problems that are facing recruiting and hiring top-tier STEM talent begins with the fact that the Federal brand itself has been damaged. Government shutdowns, hiring freezes, negative rhetoric, political interference in science have all tarnished that brand.

No. 2, opportunities for young people are hidden and scarce. You can see this from one devastating statistic. Just 4 percent of new hires in the Federal Government are drawn from Federal programs employing current students and recent graduates. The talent doesn't know about the opportunities, and therefore, they can't even pursue them.

No. 3 and really important, the hiring process is deeply broken. The barriers to entry are many. I can take my entire 5 minutes and many more on this issue. One stat that has already been cited is that it takes nearly 100 days to hire people on average, which is more than double what you would see in the private sector, but the barriers are way more diverse and problematic than that.

And No. 4, very important here, even when people are hired into the STEM field, we aren't retaining that talent once recruited. The full-time employees under 30 who voluntarily quit the Federal Government, nearly 3/4 of them have only been there for 2 years. One of the key reasons for this is that we're not creating an environment that is welcoming, that grows them. We see that in our Best Places to Work employee engagement scores, which are 15 points below in the Federal Government than they are in the private sector.

And finally, clearly, diversity in STEM is a real issue in the general workforce and a very prominent one in the Federal Government itself. So now we need to do more than just admire this problem. We need to actually do something about it. So here are 10 quick ideas that I can extend on if they are interested in the question-and-answer period.

No. 1, it begins with leadership. We need to create high expectations of Federal leaders to own this problem, and that includes in Congress the work that you're doing is fundamental. We have a

public sector leadership model. What does it look like to be a leader in government, and I would advise that this Committee and Congress more general hold executives to that model. There's also in terms of accountability our Best Places to Work rankings around effective leadership. And finally, I would say we ultimately need to reduce the number of political appointees, and that would make a big difference.

No. 2, we need to promote the government's mission, and this is something that NASA (National Aeronautics and Space Administration) has done very well as an example with their custom-built career website that includes video stories and great things that NASA people are doing. We have our Service to America medals. We need to tell the stories that will then encourage others to follow.

No. 3, we need to improve recruiting and hiring, again, lots to be done here, but the beginning point is to enact the civil service recommendations from the final report of the National Commission on Military, National, and Public Service. They did a tremendous job. That stuff is ready to go.

No. 4, we need to get young people in government, and one of the key ways to do that is to have internships be the primary mechanism of bringing them in. Government doesn't use internships nearly enough, paid internships, and there's more that can be done.

No. 5, we need to promote innovative talent models. Partnership has the cyber talent initiative where we work with several companies, MasterCard, Microsoft, Workday, and a dozen Federal agencies to create a 2-year special fellowship for top talent in cyber to come into government. Those kinds of special channels work, and we need to invest in more of them.

No. 6, we need to overhaul the pay and classification system. Think about it, the pay system we use today was designed in 1949. No private sector company is in business today operating under the same system as it did 70 years ago with respect to compensation. It doesn't work.

No. 7, we need to invest in the H.R. workforce and create a governmentwide STEM human capital strategy. It's one government and yet it operates vertically, not good enough.

No. 8, we need to create a culture that embraces technology, innovation, and collaboration. The pandemic has created lots of innovation. It should serve as a future model of how government can operate, lots to talk about there.

Nine, I mentioned DEI has to be a key part of this workforce strategy: diversity, equity, and inclusion (DEI) at all levels, including the leadership in government.

And number 10, we need your continued oversight. This ought to be an annual hearing. We ought to learn from agencies across the board, and you need to visit agencies and see what they're doing. There's great things that are going on.

And finally, help with the government brand by telling great stories about what's happening. Thank you so much.

[The prepared statement of Mr. Stier follows:]



PARTNERSHIP FOR PUBLIC SERVICE

Max Stier

President and CEO

Partnership for Public Service

Written statement prepared for

The House Committee on Science, Space, and Technology

Subcommittee on Investigations and Oversight

Hearing entitled,

“Brain Drain: Rebuilding the Federal Scientific Workforce”

March 17, 2021

Introduction

Chairman Foster, Ranking Member Obernolte, and members of the Subcommittee on Investigations and Oversight, thank you for the opportunity to appear before you today to discuss the importance of rebuilding the federal scientific workforce.

The Partnership for Public Service is a non-partisan, non-profit organization dedicated to inspiring public service and increasing the efficiency and effectiveness of the federal government. The Partnership was founded on the premise that any organization's best asset is its people.

Our federal government is the incubator for some of the world's most impactful research, innovative technological advances, and prolific scientific minds. Public servants working in STEM have developed breakthroughs that treat and cure major diseases, clarify the nature and effects of a changing climate, promote humanity's exploration of outer space, and much more. Scientists in the federal arena are unmatched in their potential to conduct research that advances the public good and apply it on a large scale. And as the COVID-19 pandemic continues to claim lives and livelihoods across the country and the world, this nation has seen a sobering reminder of how important a robust scientific workforce is to our basic health and well-being. From building and communicating critical knowledge about how the virus spreads, to developing treatments and vaccines and ensuring their safety and effectiveness, the work of scientists has the potential to save lives and help restore a sense of normality during a turbulent time.

As we move past the pandemic, we must focus on revitalizing the federal scientific workforce and preparing it for future challenges. We are on the cusp of achieving a remarkable transformation and revitalization of the federal government and its workforce, due in part to the expansion of telework and other changes in response to the pandemic. If we seize the moment, the government will have an opportunity to recruit talent wherever that talent is, ensure that the federal workforce reflects the diversity of our country, create a culture more in line with today's mobile workforce, spur innovation and use of new technologies, raise federal employee morale to meet or exceed private sector benchmarks, develop more customer-focused services, and strengthen the federal government's collaboration with state, local and tribal governments and the private and non-profit sectors. It is a once-in-a-generation opportunity to drive meaningful, systemic and lasting improvement in how government runs.

Challenges Facing the Federal Scientific Workforce

Unpacking the data on the federal scientific workforce reveals different stories across the government. There are areas of growth, including in government-wide totals – between September 2014 and September 2020, the full-time STEM workforce increased by 1.3% per year on average. Over the same period, the federal workforce overall increased by 0.9% per year on average.

However, there are concerning trends in other areas of the scientific workforce. Declines in full-time employees were particularly pronounced at agencies that employ large numbers of environmental and agricultural scientists. For example, over 700 scientists left the EPA from 2017 to early 2020, but the agency only hired half that number of scientists to replace employees who departed.¹ Between

¹ The Washington Post, "Science ranks grow thin in Trump administration," January 23, 2020. Retrieved from https://www.washingtonpost.com/climate-environment/science-ranks-grow-thin-in-trump-administration/2020/01/23/5d22b522-3172-11ea-a053-dc6d944ba776_story.html.

September 2014 and September 2020, the full-time STEM workforce at the Environmental Protection Agency decreased by 1.0% per year on average.²

At USDA, a controversial decision to relocate the offices of the Economic Research Service (ERS) and National Institute of Food and Agriculture (NIFA) from Washington, DC to Kansas City, Missouri have gutted the agency's scientific workforce. Faced with the relocation ultimatum, 40% of ERS and 60% of NIFA employees opted to quit or found other jobs.³ Between September 2014 and September 2020, the full-time workforce at ERS decreased by 10.3% per year on average, while the full-time workforce at the NIFA decreased by 11.4% per year on average.

Government also faces challenges in recruiting, hiring, and retaining a scientific workforce that looks like the American public. For example, 50.8% of the U.S. population identifies as female⁴; however, in September 2020, just 29.1% of the full-time STEM workforce identified as female, compared to 43.2% government-wide. And 39.9% of the U.S. population identifies as people of color, while just 28.6% of the full-time STEM workforce identified as people of color, compared to 37.8% government-wide.

The federal scientific workforce is also older than the U.S. labor force. The percent of full-time STEM employees under the age of 30 steadily increased from 6.9% to 9.0% between September 2014 and September 2020; however, this still lags behind the almost 20% of the employed U.S. labor force in 2020 that is under age 30.

To revitalize the workforce, the administration and Congress must address both immediate and long-standing problems. Key data points from the overall federal workforce signal the urgent need for attention to this vital national asset. These trends are not new but will be harder to fix the longer we wait:

- Just 6.8% of full-time federal workers are under the age of 30. By comparison, almost 20% of the employed U.S. labor force in 2020 was under age 30.
- Of the full-time employees on board as of the beginning of fiscal year 2019, 25% will be eligible to retire by the end of 2021; 35.5% will be eligible to retire by the end of 2024.
- In the federal IT workforce, more than 19 times more employees are over the age of 50 than under age 30.
- Use of the federal Pathways intern program, which should be a main pipeline into federal service, has plummeted. According to the [fiscal 2020 budget request](#), the number of new hires of student interns fell from 35,000 in 2010 to 4,000 in 2018.⁵
- Of the full-time employees under 30 who voluntarily quit federal service in fiscal 2019, over 73% did so with less than 2 years of federal tenure, suggesting that many young people do not have a positive work experience in the federal government or lack sufficient incentives to stay in federal service.

² Statistics on federal employees are drawn from Office of Personnel Management FedScope data on the federal workforce unless indicated otherwise.

³ Federal News Network, "After the relocation gutted its workforces, USDA research agencies struggle to rebuild," February 8, 2021. Retrieved from <https://federalnewsnetwork.com/workforce/2021/02/after-the-relocation-gutted-its-workforces-usda-research-agencies-struggle-to-rebuild/>.

⁴ U.S. Census Bureau, Retrieved from <https://www.census.gov/quickfacts/fact/table/US/PST045219>.

⁵ "Analytical Perspectives, Budget of the United States Government, Fiscal Year 2020," March 18, 2019, p.77. Retrieved from <https://www.govinfo.gov/content/pkg/BUDGET-2020-PER/pdf/BUDGET-2020-PER.pdf>.

- Data also shows major diversity challenges in the federal workforce, which grow even greater at the higher echelons of service. For example, only 35.5% of the career Senior Executive Service are female, and only 22.6% of the career SES are people of color.
- The 2019 [Best Places to Work in the Federal Government](#)⁶ employee engagement score was 61.7 out of 100, lagging behind the private sector by more than 15 points and suggesting that more can be done to cultivate a highly engaged, high-performing federal workforce.
- It takes the government an average of 98 days to bring new talent on board – more than double the time in the private sector.⁷
- About 83% of major federal departments and agencies struggle with staffing shortages and 63% report gaps in the knowledge and skills of their employees.⁸
- According to the [Survey on the Future of Government Service](#),⁹ just 32% of respondents say their agency has a strategic recruitment plan that is aligned to its workforce needs.

The Importance of Strengthening Government's STEM Workforce

The COVID-19 pandemic has affected the country in unprecedented ways, upending traditional ways of working, living and governing. What has not changed is the public's need for essential services, and federal agencies are providing them: The government has remained open, and the federal workforce has stayed on the job. Throughout the pandemic, the work of our federal scientific community has been showcased to the world – from developing a vaccine in record time to collaborating across government on treatments for COVID-19 patients – and we should leverage the moment to bring a new bench of talent into public service. Federal jobs offer mission-driven work with opportunities to help solve the biggest challenges facing our nation, including a pandemic.

Our government needs STEM talent, not only to replace those nearing the end of their careers, but also to bring new skills that will help the country rise to the significant challenges of the day and prepare for what lies ahead. In particular, the dearth of young civil servants represents a lost opportunity for our federal government as well as the nation's young professionals.

The federal government not only needs to work harder to recruit and hire great talent, but also create an environment that retains high-performing employees. Even within the constraints of the federal pay system, the government can pursue multiple strategies to make the government the employer of choice not only for entry-level talent but also for mid- and senior-level talent.

There are many reasons why government is failing to recruit and retain talent, especially young people, and the problems are deep-seated:

⁶ Partnership for Public Service, [Best Places to Work in the Federal Government](https://bestplacetowork.org/)[®]. Retrieved from <https://bestplacetowork.org/>.

⁷ Office of Personnel Management, "OPM Issues Updated Time-to-Hire Guidance," February 2020. Retrieved from <https://www.opm.gov/news/releases/2020/02/opm-issues-updated-time-to-hire-guidance/>.

⁸ Office of Personnel Management, "2018 Federal Workforce Priorities Report," February 2018. Retrieved from <https://www.opm.gov/policy-data-oversight/human-capital-management/federal-workforce-priorities-report/2018-federal-workforce-priorities-report.pdf>.

⁹ "Survey on the Future of Government Service," October 13, 2020. The survey is a collaborative effort by the Partnership for Public Service, the Princeton School of Public and International Affairs at Princeton University, the Center for the Study of Democratic Institutions at Vanderbilt University and Georgetown University. Retrieved from <https://ourpublicservice.org/publications/survey-on-the-future-of-government-service/>.

The federal government's brand is damaged. Government shutdowns, hiring freezes, and negative rhetoric have hurt the image of government and the people who serve. An Axios Harris poll in March 2019 examined the reputation of America's 99 most high-profile companies and the federal government, and the government ranked dead last.¹⁰ That was before a pandemic further eroded public confidence in government. And in the scientific community, several high-profile instances of political interference with scientific results have left doubts about whether the integrity of the work of federal scientists will be protected.

Opportunities for young people are hidden and scarce. Many students do not know about compelling career opportunities in government or how to apply for them. In addition, government hiring processes have historically shown a disproportionate preference for experienced professionals, limiting opportunities for promising young talent. For instance, internships are underused across the federal government and just 4% of new hires are drawn from federal programs employing current students and recent graduates.

Barriers to entry abound for job candidates. An unintuitive online jobs portal, a 70-year-old compensation system, and a time-to-hire average of nearly 100 days all make it difficult for government to attract top talent. Government may always struggle to match private sector salaries, but it must do better on multiple human resource fronts in the competition for mission-critical talent.

We are failing to adapt to the needs of a more mobile workforce. Our federal personnel system is geared to the model of the lifetime federal employee. We value and need those who want to dedicate their whole careers to federal service. But we also must seize opportunities to recruit those who want to serve for shorter durations, especially as younger workers increasingly want more mobility in their careers. Just 35% of millennials expect to stay with their current employer for five or more years, but there were notable correlations between those who did plan to stay and those who believe their employers perform well on issues related to financial performance, community impact, talent development, and diversity and inclusion.¹¹

Undergirding these challenges is the need for a heightened commitment to diversity, equity and inclusion. While the federal government outperforms many private sector organizations on this front, there is room for improvement in federal leadership ranks. Among career leaders in the government's Senior Executive Service (SES), just 36% are female and only 23% are people of color. And among SES leaders in STEM, just 26% are female and only 18% are people of color. Federal agencies need to do more to provide opportunities to underrepresented communities and ensure that our government mirrors the communities it serves.

Altering the status quo will not be easy but it will be critical to the nation's future. And this moment in time offers a rare convergence of opportunity: a federal workforce which has dramatically changed the way it works over the past year and is primed for adaptation amid the staggering health, social, and economic challenges it must take the lead in tackling; and the rise of Generation Z, which is technologically adept and hungry to make a difference.

¹⁰ The Harris Poll, "Axios Harris Poll 100," 2019. Retrieved from <https://theharrispoll.com/axios-harris-poll-100-2019/>.

¹¹ Deloitte, "The Deloitte Global Millennial Survey 2020," June 25, 2020. Retrieved from <https://www2.deloitte.com/global/en/pages/about-deloitte/articles/millennialsurvey.html>.

The past year has shown the dedication, resiliency and resourcefulness of the federal workforce. At many agencies, most federal employees shifted quickly to telework as the pandemic spread, while others bravely remained on the front lines in jobs that cannot be performed remotely. On all fronts, federal workers have found innovative ways to serve the people during the pandemic.

Thus, out of crisis comes opportunity. We have a once-in-a-generation moment to transform the workforce and the way it works, and to inspire Americans to enter public service. To be clear, this is not about a larger workforce; it is about a workforce that is more efficient and effective on behalf of the public it serves.

The Partnership has collected [stories](#)¹² and [case studies](#)¹³ of bright spots from the federal pandemic response that demonstrate the resilience, resourcefulness and mission commitment of public servants. A few examples:

- The Department of Energy built a virtual biotechnology laboratory to connect national laboratories and provide researchers with remote access to the technical and scientific capabilities of the labs so they could respond to COVID-19.
- A branch of the National Institute of Mental Health is using artificial intelligence and machine learning to advance research to target COVID-19, shaving years off the front end of therapeutic drug discovery development for the virus.
- In just three weeks, the Veterans Affairs Department created a COVID-19 chatbot to handle the rapid increase in call volume from veterans with questions about health care and benefits.
- A new, high-pressure ventilator the National Aeronautics and Space Administration engineers created in 37 days, tailored to treat COVID-19 patients, was approved by the Food and Drug Administration under an emergency use authorization specifically for people with the coronavirus.
- Artificial intelligence is helping the Walter Reed Army Institute of Research study potential drugs for fighting the coronavirus.
- An institute within the National Institutes of Health launched a database with medical images from tens of thousands of COVID-19 patients, which researchers can use to develop and test AI tools for fighting the virus.

Both the world and the workplace are rapidly changing. In the post-pandemic era, we must not go back to the old ways of doing business when the new ways make more sense. We should seize this moment to modernize the ways in which government operates, which in many instances are predicated on laws and practices that are decades old and out of sync with today's fast-paced digital economy, and invest in a scientific workforce for the future that can expand upon recent innovations.

¹² Partnership for Public Service, "Bright Spots in the Federal Government's Response to the COVID-19 Pandemic," February 21, 2021. Retrieved from <https://ourpublicservice.org/publications/bright-spots-federal-government/>.

¹³ Partnership for Public Service, "Bright Spots: Federal Success Stories from the COVID-19 Pandemic," February 21, 2021. Retrieved from <https://ourpublicservice.org/publications/bright-spots/>.

Solutions for Revitalizing the Scientific Workforce: What Can Congress Do?

Here are ten ways that Congress can accelerate this revitalization and transformation of the federal scientific workforce:

1) Create high expectations for federal leaders.

A transformation of the workforce and how federal employees do their jobs will not be possible without also reimagining leadership in the federal government. Good leaders motivate and advocate for their employees, build trust and create the conditions necessary for employees to perform at their best. The civilian side of government should take a lesson from the military side, where people are viewed as an asset, not a cost, and where investments in leadership development are critical to the strategy for success.

In 2019, the Partnership developed the [Public Service Leadership Model](https://ourpublicservice.org/our-work/public-service-leadership-model/),¹⁴ recognizing the unique nature of leadership in government, centered on stewardship of public trust and commitment to public good. We believe this model should be the standard for leaders – both career and political – across the federal government. The model identifies the core values that leaders must prioritize and the critical competencies they must master to achieve their agencies' missions and desired impact. These include setting a vision, empowering others and being accountable for results. We were proud to create this model with a nonpartisan group of distinguished leaders from across sectors, and in the months to come we hope to work with Congress, the executive branch and others to improve and measure overall leadership effectiveness.

Congress also should hold political and career federal leaders accountable not only for owning policy but also for the organizational health of their agencies. With respect to the workforce, Congress should hold political appointees responsible for recruiting and retaining highly qualified talent, developing future leaders, engaging employees, and holding subordinate managers accountable for addressing performance. Congress should urge agency leaders to use the annual Federal Employee Viewpoint Survey and the Best Places to Work in the Federal Government® rankings to drive better results in their agencies. Employee engagement is not just about happy employees. Higher scores in employee engagement equate to better performance and higher-quality service, which in turn become valuable recruiting tools. For example, in a recent analysis of performance data from nearly 150 Department of Veterans Affairs hospitals across the country, the Partnership for Public Service found that higher patient satisfaction, better call center performance and lower nurse turnover were all associated with a more satisfied and committed workforce.¹⁵

Congress and the administration should also embrace the bold goal of closing the over 15-point gap between the government and the private sector in the Best Places to Work in the Federal Government® engagement index, and even increasing the federal score over the private sector score. The government has a powerful asset in having a mission-driven workforce. This purpose-driven work, if combined with

¹⁴ <https://ourpublicservice.org/our-work/public-service-leadership-model/>

¹⁵ Partnership for Public Service, "Employee engagement is more than just a survey," March 2, 2020. Retrieved from <https://ourpublicservice.org/blog/employee-engagement-is-more-than-just-a-survey/>.

excellent leadership, will lead to much more engaged employees and better outcomes for the American public.

Additionally, Congress should create a separate promotional track in the Senior Executive Service for technical expertise. This technical track would mitigate the current problem of experts being promoted into the SES in recognition of their technical expertise while lacking the managerial skills that are expected in the current SES structure. A separate and prestigious technical track could be a strong recruiting and retention tool for agencies and would be particularly effective in increasing STEM leadership.

2) Promote government's mission.

Both the world and the workplace are rapidly changing. Our government needs a new generation of young people to serve in a data- and technology-driven environment, with expertise in such sectors as science, technology, engineering, finance, cybersecurity and health care. Making the federal government an "employer of choice" requires greater awareness by the government of what employees want in the workplace, coupled with improved public perception of opportunities in federal service. As the federal government struggles to attract students and recent graduates, it is clear that more must be done to improve the government's "brand." Government shutdowns, hiring freezes and negative rhetoric damage the image of government and the people who serve.

The federal government, because of budget constraints, will always have a hard time competing with the private sector on pay, but agencies almost always have an advantage in offering employees a sense of mission. Our Best Places to Work® rankings regularly show that the match between employee skills and agency mission is a key driver of employee engagement, second only to effective leadership. Too often, though, federal job announcements are dry, confusing and fail to inspire. The Partnership has identified bright spots in marketing, such as NASA's custom-built career website, which supplements USAJOBS and showcases their mission, including through videos from current employees sharing their stories.¹⁶ NASA understood that, to attract professionals in STEM fields, the agency needed to set itself apart from other employers by focusing on its unique mission and impact. Other agencies, such as the Department of the Interior, leverage social media platforms to promote their missions and the work of their agency.

The federal government needs to do more to showcase the incredible array of professional opportunities it offers and to recognize the accomplishments and innovation of the current workforce. Without compelling and shared stories of success in government, government will struggle to become an employer of choice for the tech-savvy, STEM-minded, and other forward-looking talent that government needs to attract. The Partnership's annual [Service to America Medals](#) (Sammies) program helps address this lack of recognition by highlighting the unique accomplishments of those in our federal workforce. Below are just a few examples of what honorees have accomplished:

¹⁶ Partnership for Public Service and Salesforce, "Tech to Hire: Transforming Federal HR Beginning with Recruiting and Hiring," October 3, 2018. Available at <https://ourpublicservice.org/wp-content/uploads/2018/10/Tech-toHire.pdf>.

- Created a game-changing technology that removes carbon dioxide from power plant emissions and absorbs heavy metals, such as lead, from municipal water supplies.
- Identified the chemical compound in vaping products that caused life-threatening lung injuries among young adults, communicating the danger to public health and saving lives.
- Pioneered innovative research that could lead to a cure for sickle cell disease, an illness that affects more than 20 million people worldwide.
- Built the world's largest and most influential repository of genetic sequence data now being used by biomedical researchers around the world, including those studying infectious, autoimmune and cardiovascular diseases.
- Revolutionized scientific research and our understanding of the long-term effects of concussions, including chronic traumatic encephalopathy, in veterans and athletes.
- Conducted important research on the harm that commonly used chemicals have on eyesight and the central nervous system, leading to new standards to protect the public from overexposure to toxic substances.

This subcommittee can also play an important role in encouraging colleagues to recognize the successes of the federal workforce. Federal employees are often blamed for policy failures, and rarely acknowledged when things go right. One way to revitalize the workforce is simply to change the tone and get away from the demeaning rhetoric that frequently characterizes discussion of the federal workforce. Political leaders should celebrate outstanding contributions, such as the remarkable achievements of the nominees and winners of the annual Service to America Medals¹⁷ and the Presidential Rank Awards.

3) Improve recruiting and hiring.

Congress should start the hard process of updating the legal framework for the civil service, much of which dates back to laws passed in 1949 and 1978. The federal government needs doctors, economists, emergency response specialists, and cybersecurity experts, but we have a personnel system designed for phone operators. The antiquated system is an impediment to the government's ability to meet the needs of today's interconnected, technology-driven world and prepare for the challenges of the future. A government-wide initiative could help agencies improve the hiring process so they can more easily attract, assess, hire and onboard highly qualified applicants. This effort should include simplifying and demystifying the application processes, including the USAJOBS portal.

As a starting point, Congress should enact the civil service recommendations of "[Inspired to Serve](https://servicetoamericamedals.org/)," the final report of the National Commission on Military, National and Public Service.¹⁸ On a bipartisan and consensus basis, and after studying the federal civil service for over two years, the Commission issued last year a bold and thoughtful set of recommendations for improving talent management, including proposals to make federal hiring more efficient. We urge Congress to move forward as quickly as possible to enact these proposals. Some key Commission recommendations – and ideas the Partnership has long supported – include:

¹⁷ <https://servicetoamericamedals.org/>

¹⁸ National Commission on Military, National and Public Service, "Inspired to Serve," March 25, 2020. Retrieved from <https://inspire2serve.gov/reports>.

- Amending the criteria for direct hire authority to enable agencies to use this authority when they face a shortage of highly qualified applicants.
- Expanding direct hiring authority for students and recent graduates.
- Allowing agencies to noncompetitively re-hire federal employees at any grade for which they are qualified.
- Modernizing the veterans' preference rules, which are currently confusing for both agencies and veterans alike.
- Improving the Pathways programs, which include the Presidential Management Fellows and intern and recent graduate programs.

4) Get young people in government.

Today's college students are interested in making a difference, but those considering the federal government as a place where they can do so face challenges in getting hired. Programs that Congress should reinvigorate include the Pathways programs, which provide younger, early career talent with exposure to and positive experiences working in government. Needed improvements include ensuring internships are paid and easing agencies' ability to convert interns into full-time positions. In addition to lifting the caps on the expedited hiring authority for students and recent graduates, Congress should also consider a ROTC-like program for federal service and encourage agencies to recruit on campuses.

The need to improve the hiring process is especially urgent for STEM jobs, where government must compete with private sector companies developing emerging technologies. The federal government's antiquated hiring system is not designed to compete at the speed of private sector companies who can actively recruit and quickly hire young STEM talent. Dr. Elizabeth Kolmstetter, NASA's Director of Talent Strategy and Engagement, gave an example of one Texas A&M student who met a SpaceX recruiter and was offered a job the same day, finalized the offer over the weekend and moved to California the next week to begin work.¹⁹ Kolmstetter also noted that in fiscal year 2018 about 61% of NASA's engineering vacancies, 87% of scientist vacancies, and 86% of mathematics vacancies had fewer than three qualified (not most qualified)²⁰ applicants. The talent is out there, and government's mission remains more compelling than ever, but agencies are losing out because the federal hiring system isn't nimble enough to compete with the private sector.

While internships are a critical component of the talent pipeline and agencies should strategically recruit and hire college students, government should also aim to reach future scientists earlier in their lives. STEM education and exposure to the work of federal employees can be foundational experiences for students as early as elementary school. Finally, representation matters and if government hopes to recruit more women and people of color to the scientific workforce, it would be well served to share their stories with the next generation.

¹⁹ Testimony before the National Commission on Military, National, and Public Service, "Public Service Hearing: Critical Skills and Benefits," May 15, 2019. Retrieved from https://inspire2serve.gov/sites/default/files/2020-09/Kolmstetter%20Testimony_Public%20Service%20Hearing_Critical%20Skills%20and%20Benefits.pdf

²⁰ Qualification standards are "a description of the minimum requirements necessary to perform work of a particular occupation successfully and safely," according to [OPM](#).

5) Promote innovative talent models.

To attract talent at all levels, Congress and the administration should work together to create new and innovative pathways – and expand existing ones – for diverse mission-critical talent to join public service through fellowships, talent exchanges and service corps.

In 2019, the Partnership collaborated with Mastercard, Microsoft, Workday and a dozen federal agencies to establish the [Cybersecurity Talent Initiative](#), which aims to build the next generation of cyber leaders for our country. This innovative cross-sector opportunity enables recent graduates to spend two years working for and receiving training in the federal government in a cyber-related position. At the end of two years, they will have an opportunity to apply for a position with one of the corporate partners and, if hired, will be eligible to receive student loan assistance up to \$75,000 from their private sector employer. This model is the first of its kind. The inaugural class of eight future cybersecurity leaders brings a variety of academic and professional experience to five federal agencies.

One benefit of these efforts is that we are educating young people about cyber careers across sectors and helping them learn about organizations and missions they may have never heard of before. Other federal programs like the U.S. Digital Service, 18F, and Presidential Innovation Fellows allow “technical tours of duty” with the federal government and are unique in helping promote and respond to an increasing desire for the next generation to be more mobile in their careers. The programs provide a model for filling other “hard-to-fill” positions in government.

6) Overhaul the pay and classification system.

The government’s 1949 pay and classification system was designed for clerical workers, not for the highly professional, specialized skills that are needed in today’s civil service. The lack of an occupation-specific, market-based compensation system is particularly damaging to the ability of the federal government to recruit and retain scientists, many of whom have far more lucrative opportunities in the private sector. The OPM Handbook of Occupational Groups and Families contains 407 separate job series. The sophisticated cyber, IT, data science and STEM skills that the government badly needs were barely envisioned when the system was created. We need broader pay-banding that allows agencies the flexibilities to set more market-based, occupational-specific salaries. Unique pay systems like that created under the authority of the Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) of 1989 are an acknowledgement that a rigid pay system does not work. While the federal government will never be able to match private-sector salaries for many positions, broader pay bands would enable agencies the flexibility to attract the most critically needed talent.

The Partnership’s report, “[Building the Enterprise: A New Civil Service Framework](#),”²¹ laid out a new pay-setting process for the federal workforce. The modernized pay system would establish broad pay bands for employees rather than rigid grades, better align salaries and benefits on an occupation-by-occupation basis, set salaries based on those comparisons and give agencies the flexibility to bring talent in at the appropriate salary level. While this is a long-term effort, allowing market-based pay for specific

²¹ Partnership for Public Service, “A Time for Talent: Improving Federal Recruiting and Hiring,” August 26, 2020. Retrieved from <https://ourpublicservice.org/publications/building-the-enterprise/>.

mission-critical occupations in the near term is a place to start and would help attract and retain needed talent. Again, the final report of the National Commission on Military, National and Public Service also endorses a comprehensive modernization of the entire federal talent management system.

7) Invest in the HR workforce.

The Partnership's recent studies reinforce the need for investment in the federal human resources workforce. For example, our "[State of Renewal](#)" report lays out recommendations for improving the State Department's talent management life cycle over six to twelve months, without the need for any additional legislation, as well as changes that will take longer and require Congressional action. Our report "[Time for Talent: Improving Federal Recruiting and Hiring](#)"²² lays out practical approaches that agencies can take within the existing system to attract mission-critical talent. And in "[Rapid Reinforcements: Strategies for Federal Surge Hiring](#),"²³ we identified strategies that can help agencies when faced with circumstances that require a rapid growth in the workforce, such as national emergencies, large-scale attrition, new mission requirements, or the need for emergent skills.

Agencies cannot move forward on these recommended strategies, however, unless their human resource offices have the requisite skills, capacity and tools. There are outstanding and innovative HR professionals across the government, but there are also skills gaps in their offices. They are often overwhelmed by responsibilities and the complexities of federal human capital law. Often, HR specialists are not familiar with the authorities they have available to them, and do not have the technologies, data and analytical skills that would better enable them to recruit and hire while also engaging in strategic workforce planning for the future.

OPM, the White House Office of Science and Technology Policy (OSTP) and agencies with large STEM hiring needs should create a government-wide STEM human-capital strategy to project future needs and develop a list of actions that can address STEM hiring challenges, without diluting the ability of agencies to tailor and innovate on their own. That government-wide strategy should include an integrated, interagency set of special STEM salary rates that keep the government competitive for STEM talent.

Congress should jump-start efforts to increase the skills and professionalism of the federal HR community by requiring OPM to start providing technical training to HR specialists again, conducting a review of overall training needs and how those needs can be met, and funding IT needs of the HR community. Congress should also ensure that agencies undertake strategic workforce planning and make sure that Chief Human Capital Officers have a voice in the strategic and budget planning processes so that agency leaders will be informed of the HR needs necessary to carry out their policies and programs.

²² Partnership for Public Service, "A Time for Talent: Improving Federal Recruiting and Hiring," August 26, 2020. Retrieved from <https://ourpublicservice.org/publications/a-time-for-talent/>.

²³ Partnership for Public Service, "Rapid Replacements: Strategies for Federal Surge Hiring," October 29, 2020. Retrieved from <https://ourpublicservice.org/publications/rapid-reinforcements-strategies-for-federal-surge-hiring/>.

8) Create a workforce culture that embraces technology, innovation and collaboration.

Our new report “[Resilient: Keeping Your Wits – Workforce, Innovation, Technology, Security – About You](#),”²⁴ summarizes a survey of 300 federal leaders and a series of roundtable discussions on the lessons of the pandemic. A key takeaway is that an agile workforce, cutting-edge cybersecurity, modern technologies, and continual innovation are all interdependent in creating resiliency in the federal government. Also, when asked what a resilient federal government looks like, more respondents linked resiliency to an agile workforce than the other issue areas discussed in the report.

The success of the federal workforce depends not only on the quality of its talent and its leaders, but also on a culture where employees are encouraged to try new ideas and make smart technology investments. The new workplace environment must also involve more collaboration between federal, state, local and tribal governments and the private and non-profit sectors, a frequent lapse that is on full display now with the uneven rollout of the coronavirus vaccines.

Recognizing that revitalizing the government requires attention to leadership and stewardship, talent, innovation and technology, and collaboration, the Partnership’s “[Roadmap for Renewing the Federal Government](#),”²⁵ launched last fall, describes the challenges the government faces in each of these areas, bright spots showing improvements, and needed solutions. The Roadmap provides a checklist of actions that the new administration can take in the first 100 days to begin to lay the groundwork for renewing the federal government, and the issue pages on the website summarize proposals that we believe should have the support of both Congress and the administration.

9) Make diversity, equity and inclusion a central part of workforce strategy.

A commitment to diversity, equity and inclusion must be a cornerstone in the transformation of how the government recruits, hires, develops and retains talent.²⁶ The Partnership hears consistently from current and former agency leaders that it is critical to address this issue in the scientific community. This commitment ultimately leads to higher organizational performance by ensuring the door is open for top talent and by enabling new and creative ways of thinking that empower better decision making. Also, a government that better reflects its people also will increase public trust in our democratic institutions.

President Biden has issued a memorandum prioritizing diversity, equity and inclusion as a national security imperative, in order to ensure that critical perspectives and talents are represented in the

²⁴ Partnership for Public Service, American Council for Technology and Industry Advisory Council, and Meritalk, “Resilient: Keeping Your Wits – Workforce, Innovation, Technology, Security – About You,” January 25, 2021. Retrieved from <https://ourpublicservice.org/publications/resilient-keeping-your-wits-about-you/>.

²⁵ Partnership for Public Service, “Roadmap for Renewing the Federal Government. Retrieved from <https://ourpublicservice.org/roadmap-for-renewal/>.

²⁶ For example, see Jennifer Miller, “For young job seekers, diversity and inclusion in the workforce aren’t a preference. They’re a requirement,” Washington Post, February 18, 2021. Retrieved from <https://www.washingtonpost.com/business/2021/02/18/millennial-gen-z-workplace-diversity-equity-inclusion/>.

entire national security workforce.²⁷ Congress should support these efforts, and should help ensure that diversity, equity and inclusion are in the DNA of every department and agency in the federal government.

10) Continue oversight and get to know federal employees.

The subcommittee today is helping to identify challenges facing the federal scientific workforce and find solutions. We encourage you to make this hearing an annual occurrence. The subcommittee could follow up by holding a hearing on scientific agencies and subcomponents that are doing well with STEM recruiting, hiring and employee engagement, to help celebrate success and encourage replication.

Members of Congress should also get out to visit agencies and their employees and hear from those on the front lines. Visiting federal employees where they work, whether at headquarters or in the field, is one of the best ways to understand both the deep challenges facing the federal scientific workforce and the incredible work that the federal government does on behalf of the American people every day. Better yet, the vast majority of federal employees are located outside of Washington, in every state and congressional district – so they are also your constituents.

Finally, policymakers should remember that they are stewards of government’s brand. How Members of Congress discuss public servants matters, especially when communicating with the next generation. When speaking to students – in formal settings like commencement speeches or simply in conversations with constituents – take the opportunity to share government’s unique, mission-focused work and the vital role of federal employees.

Conclusion

Thank you again for holding this hearing. Revitalizing the scientific workforce is a complex but necessary endeavor, and this testimony only scratches the surface of the efforts that are needed across the executive and legislative branches. We look forward to working with you and your staff as you move forward with your legislative and oversight agenda for the federal scientific workforce in the 117th Congress.

²⁷ President Joseph R. Biden Jr., “Memorandum on Revitalizing America’s Foreign Policy and National Security Workforce, Institutions, and Partnerships,” February 4, 2021. Retrieved from <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/04/memorandum-revitalizing-americas-foreign-policy-and-national-security-workforce-institutions-and-partnerships/>.



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Max Stier is President and CEO of the Partnership for Public Service, a nonprofit, nonpartisan organization dedicated to revitalizing our federal government by inspiring a new generation to serve and by transforming the way government works.

Under Stier's leadership, the Partnership has been widely praised as a first-class nonprofit organization and thought leader on federal workforce issues. Innovative Partnership programs such as *Call to Serve*, a network of more than 600 colleges and universities and 75 federal agencies, help to inform and inspire students while building a pipeline of new talent into the federal government. Partnership research projects such as the *Best Places to Work in the Federal Government* rankings highlight exemplary federal agencies while encouraging other agencies to improve by adopting best practices. Stier's commitment to shining a light on talented federal employees is also the driving force behind the Partnership's *Service to America Medals* program, which culminates each year with a black-tie gala honoring the great work of our country's unsung heroes.

Stier previously worked in all three branches of the federal government. Prior to joining the Partnership, he served as the Deputy General Counsel for Litigation at the Department of Housing and Urban Development. He clerked for Chief Judge James Oakes of the U.S. Court of Appeals for the Second Circuit in 1992 and clerked for Justice David Souter of the U.S. Supreme Court in 1994. Between these two positions, Stier served as Special Litigation Counsel to Assistant Attorney General Anne Bingaman at the Department of Justice. His career in government service began in 1982, when he served on the personal staff of U.S. Representative Jim Leach (R-IA).

Stier's professional experience also includes practicing law at the firm of Williams & Connolly, where he focused primarily on white collar defense.

Stier is a graduate of Yale University and Stanford Law School, and is a member of the New York State Spending and Government Efficiency (SAGE) Commission and The Brookings Institution's Public Sector Leadership Advisory Board.

Chairman FOSTER. And thank you. And I think your—the last thing—or second to last thing you said was spot on. The importance of having Members of Congress visit the agencies, you know, one of my biggest activities in Congress as the Co-Chair of the National Labs Caucus where I drag Members of Congress around to visit the Department of Energy national labs, which is—you know, they are without exception just blown away with the tremendous science that's being done there. And equally important would be in-person visits to all of the science operations in all of our Federal agencies, so I definitely agree with that.

And so next is Dr. Rosenberg.

**TESTIMONY OF DR. ANDREW ROSENBERG,
DIRECTOR OF THE CENTER FOR SCIENCE AND DEMOCRACY,
UNION OF CONCERNED SCIENTISTS**

Dr. ROSENBERG. Thank you, Chairman Foster and Ranking Member Obernolte and Members of the Subcommittee. My name is Andrew Rosenberg, and I direct the Center for Science and Democracy at the Union of Concerned Scientists.

Federal scientists are on the frontlines of our Nation's capability to respond to society's needs from forecasting natural disasters to natural resource management to responding to pandemics, and federally funded basic research that enables scientific discovery and innovation is critical to economic growth, employment, and sustainable development. All science-based agencies from the Defense Department to NASA to the Departments of Agriculture, Commerce, and Energy depend on a strong, continuously renewed scientific workforce.

The last 4 years have seen a significant reduction in the scientific workforce at many Federal agencies. Our report with the Federal brain drain found that five of the seven agencies we analyzed collectively lost more than 1,000 scientific staff. Few agencies fared worse than the Environmental Protection Agency. In the last 4 years EPA lost nearly 6 percent of its workforce and more than 670 staff, including in regional offices, especially in the West, Southwest, and Midwest.

For some agencies, growth stagnated. The CDC (Centers for Disease Control and Prevention) lost 187 scientific staff prior to the pandemic. That's a loss of 2.2 percent. Now, we recognize that demography was part of the driving force of this loss, but the inflow of new talent was squeezed as well. Fellowships were curtailed and recruitment was stagnant.

Morale matters, too, for retention, recruitment, and productivity. We tracked more than 119 instances of attacks on science during the Trump Administration, far outnumbering previous Administrations. When we surveyed more than 4,000 Federal scientists in 2018, 80 percent of respondents said they noticed workforce reductions and nearly 90 percent reported that these losses made it difficult to fulfill their missions. And at the EPA fewer than 15 percent of surveyed scientists reported their morale is excellent or good.

In January, the Biden Administration issued a key memorandum on restoring trust to government agencies through scientific integrity and evidence-based policymaking. That's an important step for

restoring morale but more is needed. Representative Tonko has re-introduced the *Scientific Integrity Act*, which would codify in statute the prevention of political interference or manipulation of scientific evidence.

The Administration and Congress need to rebuild and strengthen Federal science—scientific capacity, diversify the scientific workforce, and revitalize the pipeline that brings early career scientists into civil service. Specifically, increasing fellowship programs such as the management—Presidential Management Fellowship, the STAR, the Sea Grant, the Oak Ridge programs bring new talent to agencies, but they have been curtailed and need to expand again.

New fellowship programs should be created that tackle other science-related issues such as climate change or equity in environmental justice. And to diversify the workforce, agencies must also ensure that recruitment is broader and compensation resources and benefits for fellows are sufficient for those with economic challenges, not just the privileged few.

Recruitment must reach new audiences and counteract the tendency for hiring managers to recruit from a known set of institutions again and again. Every effort should be made to recruit by hosting far more events at historically Black, Hispanic, and tribal institutions. The Administration must learn from private and nonprofit sectors about recruiting tools. Job fairs and other techniques must target a wider array of institutions than in the past and account for historical disparities in recruitment and hiring. And agencies must learn to work effectively with institutions unaccustomed to steering students toward civil service. If you want to see how outdated the recruitment system is, just have a look at USA Jobs, the website that we currently use.

Reaching scientific capacity quickly will require not only recruiting and hiring to fill vacancies but also re-engaging with those that have retired from Federal service to regain lost knowledge, experience, and expertise. Federal agencies must train mid- and senior-level scientists in leadership of diverse staffs. Effective science leaders and mentors are not necessarily those who publish the most papers or have been in service the longest. These are learned skills critical for the effectiveness of any enterprise. And young scientists today are used to changing jobs and career paths frequently, so the civil service must evolve accordingly. More extensively utilizing programs for rotating assignments, remote work, joint appointments, and joint institutes increases career flexibility.

I appreciate the opportunity to share my views, and I'd be happy to answer any questions. Thank you.

[The prepared statement of Dr. Rosenberg follows:]

Written Testimony for Andrew A. Rosenberg, Ph.D
Director, Center for Science and Democracy
Union of Concerned Scientists
 U.S. House Committee on Science, Space, and Technology
 Subcommittee on Investigations & Oversight Hearing

“Brain Drain: Rebuilding the Federal Scientific Workforce”

March 17, 2021

Thank you, Chairman Foster, Ranking Member Obernolte, and Members of the Subcommittee for holding this important hearing on the loss of scientific capacity in the federal workforce. My name is Dr. Andrew Rosenberg, and I am the Director of the Center for Science and Democracy at the Union of Concerned Scientists. I appreciate the opportunity to testify before you today.

My experience spans more than 30 years in government service, academia, private sector consulting, and nonprofit leadership. I have authored more than 110 peer-reviewed papers and co-authored numerous national and international scientific reports, including the National Climate Assessment, the World Ocean Assessment, and the report of the US Commission on Ocean Policy. Prior to my time at UCS, I served as the Deputy Director of the National Marine Fisheries Service (NMFS) within the National Oceanic and Atmospheric Association (NOAA), a role I held under both Democratic and Republican administrations. Subsequently, I was Dean of Life Sciences and Agriculture and Professor of Natural Resources at the University of New Hampshire.

I am here today on behalf of the Union of Concerned Scientists. UCS is a non-partisan, national nonprofit organization that seeks to advance science-based solutions to our world’s most pressing problems. Our staff includes scientists, engineers, economists, analysts, and advocates, and we are backed by a network of more than half-million supporters and our extensive Science Network, comprised of 25,000 scientists and experts across the country. For more than 50 years, UCS has championed the need to ground governmental decisions in the best science available.

Since 2012, I have led UCS’s Center for Science and Democracy in its efforts to advance the role of science in public policy. We work to ensure that policymakers and the public have access to the independent science needed to make informed decisions about public health, safety, and the environment. We also train scientists to be engaged in public policy issues, from climate change to environmental justice.

Why Federal Science Matters

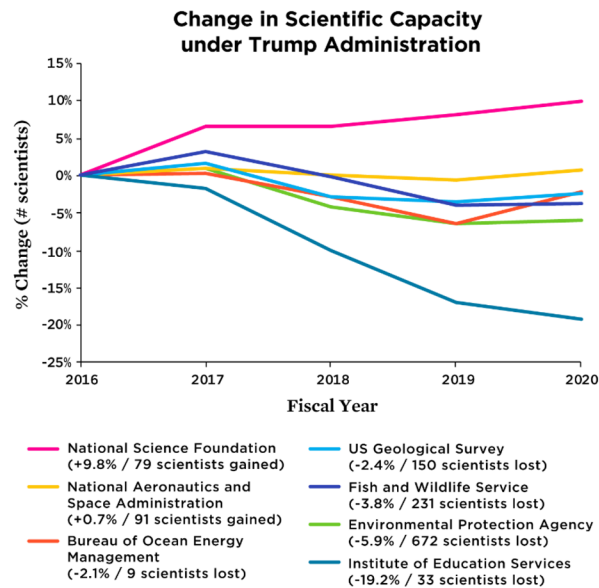
At NOAA, UNH, and at UCS, I have witnessed firsthand how vital U.S. federal agencies and their scientists are to the well-being of Americans and our democracy. Whether they are studying the impact of climate change on the nation’s food supply, forecasting and preparing for natural disasters, or fighting the spread of COVID-19, federal scientists are on the cutting edge of our nation’s capability to respond to society’s needs.

Of course, not all science is done or funded by federal agencies, but federal science and funding undergirds much of the basic research that enables scientific discovery and innovation. With the solid groundwork of federal science, innovation from the federal workforce, academia, state and tribal scientists, and the private sector can flourish.

No matter the science-based agency, from the Defense Department to NASA to the Department of Agriculture, the groundwork depends on a strong, continuously renewed scientific workforce. This will enable these experts to do what they do best: protect public health and safety, strengthen national security, build the economy of the future, and serve the American people.

Scientific Capacity Declines in Federal Agencies

The last four years have seen a significant reduction in the scientific workforce at many federal agencies. Earlier this year, UCS released a report, *The Federal Brain Drain*,¹ that examines changes in scientific capacity during the Trump administration, and the impacts of those changes on federal agencies. This report, led by Dr. Jacob Carter, Taryn MacKinney, and Dr. Gretchen Goldman, found that five of the seven agencies we analyzed collectively lost more than 1,000 scientific staff. For example, the Fish and Wildlife Service lost nearly 4% of its scientists—some 230 staff. Even small agencies saw big losses: The Department of Education’s research branch, the Institute of Education Services, lost 33 scientific staff—a staggering 19% decline.



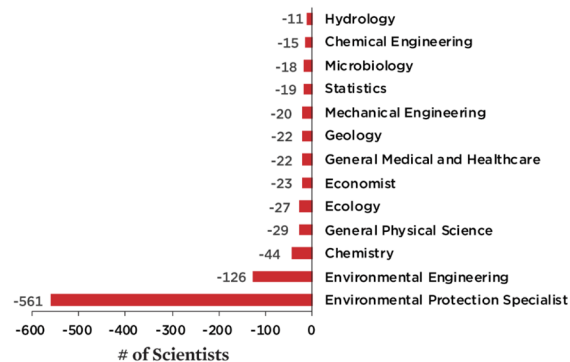
Few agencies fared worse than the Environmental Protection Agency (EPA). Between 2016 and 2020, the EPA lost nearly 6% of its scientific workforce—more than 670 staff. This includes more than 550 environmental protection specialists—1 in 4. These specialists implement air and water quality programs and track environmental law violations, tasks that the last administration spurned.

¹ Carter, J., T. MacKinney, and G. Goldman. 2021. *The Federal Brain Drain: Impacts on Science Capacity, 2016-2020*. Cambridge, MA: Union of Concerned Scientists. <https://www.ucsusa.org/resources/federal-brain-drain>.

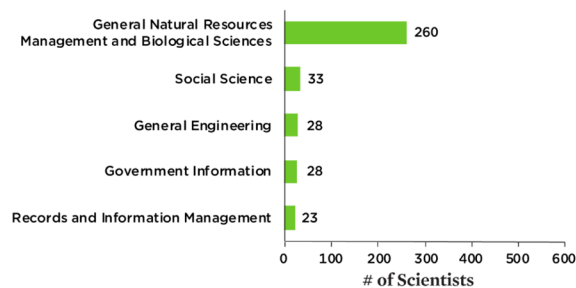
The EPA lost hundreds of highly specialized scientists, too. For example, environmental engineers work to prevent pollution and protect public health; the EPA lost 126 of them. 11 hydrologists, 22 geologists, and 19 statisticians were also lost—about a third of jobs in each category—as were 1 in 10 chemists, 1 in 5 ecologists, and nearly 1 in 4 microbiologists.

EPA Job Series with Biggest Losses/Gains

a. 10 or More Employees Lost



b. 10 or More Employees Gained



Every single one of the EPA's regional offices lost scientific staff, especially offices in the West, Southwest, Great Plains, and Midwest. At the same time, some fellowship programs, such as the EPA's Science To Achieve Results (STAR) program, were cut. This reduced funding for graduate students and shrank opportunities for early-career scientists to gain experience at federal agencies—both critical to attracting bright young scientists to the federal workforce.

For some agencies, growth stagnated. The Centers for Disease Control (CDC) has consistently gained scientific staff since 1995. In terms of net scientific staff, it saw losses only twice in 25 years, once in 2006, when it lost 63 staff, and once in 2013, when it lost 5. But for the first three years of the Trump

administration, it lost 187 scientific staff, a loss of 2.2%. It grew by a meager 4.4% in 2020, when the pandemic began; by comparison, CDC scientific capacity grew by 31% during President Obama's first term.

The work of scientists across the government, from health experts at the CDC to engineers at the EPA, has direct impacts on the American people, so a loss of scientists means a loss of research, and slower progress on critical health and safety issues. Without the experts, the science we rely on for clean water, breathable air, a livable climate, and safe homes, schools, and communities can erode.

Federal Scientists Survey Results

The numbers from the *Federal Brain Drain* report validate what many civil servants have long witnessed: the decline of federal science. In addition to analyzing the changes in scientific capacity, we also tracked more than 190 instances of attacks on science² during the Trump administration, from suppressing reports on climate change to sidelining public health experts during the pandemic. These attacks far outnumber the 22 attacks we tracked during the Obama administration and 98 during the Bush administration. Stories abound of scientists being ignored, defunded, and pushed out of their positions.

Survey data from federal scientists confirm this. Since 2005, UCS has partnered with the Center for Survey Statistics and Methodology (CSSM) at Iowa State University to periodically survey thousands of scientists across federal agencies. In each of our surveys, we ask scientists about workplace morale, scientific integrity policies, and more. When we surveyed more than 4,000 federal scientists in 2018,³ nearly 80% of respondents said they noticed workforce reductions due to staff departures, hiring freezes, or retirement buyouts. Of these scientists, nearly 90% reported that these losses made it difficult to fulfill their agency's science-based missions.

Many respondents reported decreased job effectiveness and satisfaction, too. Across all agencies, nearly 40% of responding scientists reported that the effectiveness of their division or office had decreased over the past year, while only 15% reported an increase. And at the EPA, fewer than 15% of surveyed scientists reported their morale as excellent or good.

Given the range of problems described by federal scientists—including workforce cuts, censorship and self-censorship, political interference, and undue industry influence—these declines in morale and effectiveness may not be surprising, but they should disturb anyone who believes that government science has a crucial role to play in making the United States a safer, healthier nation. When science is politically manipulated or suppressed, or scientists are censored or sidelined in the policy-making process, senior scientists may leave government and early-career scientists may rethink their careers. This is not just unfortunate, but also dangerous: the public deserves, indeed requires, access to vital scientific information.

When Science and Scientific Leadership are Sidelined

The consequences of undermining science can be serious. One such example, known as “Sharpiegate,” took place during a time of national emergency, as a Category 5 hurricane neared the US coast. After then-President Trump made false claims about the path of the hurricane, federal scientists rightly

² Union of Concerned Scientists (UCS). 2017a. “Attacks on science.” Reports & multimedia: Feature, January 20. www.ucsusa.org/resources/attacks-on-science.

³ Carter, J. 2018. The good, the bad, and the ugly: The results of our 2018 Federal Scientists Survey. The Equation. Cambridge, MA: Union of Concerned Scientists. Blog, August 14. <https://blog.ucsusa.org/jacob-carter/the-good-the-bad-and-the-ugly-the-results-of-our-2018-federal-scientists-survey>.

provided the correct information to the public—and were censored by political officials and threatened with losing their jobs for contradicting the president. These political officials’ actions were unlawful, diverted resources from hurricane efforts, and caused public confusion and panic. As this incident demonstrates, preventing federal scientists from providing needed scientific information to the public can endanger people’s lives in times of crisis.

Scientific leadership matters, too. All modern presidents and their appointees at federal agencies have relied on scientific advice from entities such as the presidential Science Advisor, the White House Office of Science and Technology Policy (OSTP), the President’s Council of Advisors on Science and Technology (PCAST), and advisory committees within federal agencies. In its first year, the Trump administration filled only 20 of the 83 government posts that the National Academies of Science designate as “scientist appointees.”⁴ At the same point in their respective administrations, President Barack Obama had filled 63 such positions and President George W. Bush had filled 51. The Trump administration also left the critical position of presidential science advisor vacant for almost two years.

President Biden named his nominee for presidential Science Advisor and Director of OSTP before his inauguration and, in a historic first, elevated the role to a Cabinet-level position. In doing so, the Biden administration sent a clear signal that scientific expertise matters.

Scientific Integrity and Revitalizing the Federal Scientific Workforce

Science must be at the forefront of decision-making in government agencies, and agencies must have policies that embody this. Federal scientists work for the public, and they need to be able to conduct research on behalf of the public without fearing that they will become political targets. They must be able to communicate openly and honestly—to the scientific community, the press, and the public—about the threats we face and potential solutions. Political appointees must be prevented from altering or suppressing scientific findings. Federal scientists should be able to follow their research wherever it leads, incorporating scientific evidence on pressing issues like climate change and making decisions that help communities, particularly the most vulnerable. Agencies should implement policies designed to build diversity and reduce racial inequities in civil service. The scientific workforce of the country is drawn from and speaks to everyone in the country, and the public must identify with and trust the messengers as well as the message.

Fortunately, we have already seen progress toward achieving this vision. Since 2011, 24 federal agencies have developed scientific integrity policies, many of which provide the protections necessary to foster a culture of scientific integrity at federal agencies.⁵

In January, the Biden administration issued a memorandum on *restoring trust at government agencies through scientific integrity and evidence-based policy making*—reaffirming and building upon steps initially taken by the Obama administration.⁶ President Biden’s directive helps ensure that the public

⁴ Reed, G., S. Shulman, P. Hansel, and G. Goldman. 2018. *Abandoning Science Advice: One Year in, the Trump Administration Is Sidelining Science Advisory Committees*. Cambridge, MA: Union of Concerned Scientists. <https://www.ucsusa.org/sites/default/files/attach/2018/01/abandoning-science-advice-full-report.pdf>.

⁵ Goldman, G.T., E. Berman, M. Halpern, C. Johnson, Y. Kothari, G. Reed, and A.A. Rosenberg. 2017. Ensuring scientific integrity in the age of Trump. *Science*, 355(6326): 696-698, March 9. <https://science.sciencemag.org/content/355/6326/696>.

⁶ Biden, J.R. 2021. *Memorandum for the Heads of Executive Departments and Agencies, Subject: Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking*. Memo, January 27.

benefits from the best independent science and that federal agencies craft smart, effective public health, safety, and environmental protections based on that science.

The presidential memorandum is an important step forward, but there is more that Congress can and should do to protect federal scientists. Last month, Representative Paul Tonko (D-NY) re-introduced the Scientific Integrity Act, which, if passed, would help to ensure that the public benefits from the best available federal science, from food safety to weather monitoring to medical research.

With the support and resources of the Biden administration and champions for scientific integrity in the House and Senate, including Representative Tonko, Senator Schatz (D-HI), and the Members of this committee, the process of revitalizing the federal scientific workforce can be carried out. Agency officials must take further steps to implement policies designed to build diversity and reduce racial inequities in civil service. Having a federal workforce that reflects the diversity of the country is as important now as it ever was—and so is returning science to its essential role across government in service of the public good.

Policy Solutions

The Union of Concerned Scientists has long advocated for a strong and well-resourced federal scientific workforce. It is not enough to just restore the federal scientific workforce of previous administrations; we now have an opportunity to modernize it, as well. Career opportunities, lifestyles and expectations have changed rapidly since I was a civil servant. As a nation, we train hundreds of thousands of young professionals in STEM fields coming from every community in the country. We need their talent and passion, but we need to meet their needs, too.

The Biden administration and Congress should work to build and strengthen scientific capacity beyond pre-2017 levels, diversify the scientific workforce, and revitalize the pipeline that brings early-career scientists into civil service.

UCS recommends that Congress and the Biden administration:

- **Increase the number of early-career scientists entering the federal government by strengthening scientific fellowship programs.** This could include, for example, reinstating the STEM-specific track of the Presidential Management Fellowship program. Early-career fellowships and student grants already exist in some federal programs, (e.g., STAR, Sea Grant, Oak Ridge Institute for Science and Education). The Biden administration should consider funding fellowships that tackle other science-related issues, such as climate change or equity and environmental justice. To diversify the workforce, agencies must also ensure that compensation, resources, and benefits for fellows are sufficient for those with economic challenges, not just the privileged few.
- **Support increases in scientific capacity through the White House science and technology budget, which sets the administration's priorities for federal research and development, and congressional appropriations.** Committees should provide agencies with the funding they need to revitalize their scientific workforces. This needs to be a concerted effort, for recruitment, training, mentorship, fellowships, and other needs.

<https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/>.

- **Strengthen the scientific workforce with both recruitment and rehiring strategies.** Reaching scientific capacity quickly will require not only recruiting and hiring to fill vacancies, but also reengaging with those who have retired from federal service, to regain lost knowledge, experience, and expertise. Rehiring or contracting with some of the federal scientists who left or were forced out of civil service, along with recruiting early-career scientists, will build competency more quickly, restore institutional knowledge, and enable a system of mentorship of early-career staff.
- **Increase public access to information and training on applying for federal positions and modernize the recruitment website USAJobs.gov.** Every effort should be made to provide such information to communities that have historically been underrepresented in federal scientific positions—for example, by hosting events at Historically Black Colleges and Universities (HBCUs) and Tribal Colleges (TCUs). Recruitment for the federal scientific workforce must reach new audiences and counteract the tendency for hiring managers to recruit from a small, known set of institutions again and again. Many federal scientists work all around the country in regional laboratories, national centers of excellence, national laboratories, and field stations. Providing greater understanding of the opportunities available to early-career scientists is as important as simply posting job openings more broadly. The USAJobs website is dated and convoluted, while the private sector has advanced its recruiting tools substantially. The Biden administration can and should learn from the private and nonprofit sector about recruiting tools.
- **Make diversifying the federal scientific workforce a priority.** Efforts should be made to ensure that scientific career opportunities throughout the federal government, including in agencies and scientific advisory committees, are accessible to experts from various backgrounds and particularly for those that have historically been underrepresented in federal scientific positions. Recruitment, including job fairs and other techniques, must target at a wider array of institutions than in the past and account for historical disparities in recruitment and hiring. Agencies must learn to work effectively with institutions unaccustomed to steering students towards civil service.
- **Train mid-career and senior-level scientists to effectively mentor early-career staff.** Federal agencies should implement and increase such trainings if they already exist and develop them if they do not. Effective leadership and mentoring is not necessarily accomplished by the scientists who publish the most papers or have been in service the longest. These are learned skills critical for the effectiveness of any enterprise and must be approached that way.
- **Allow scientists to work with government in new ways.** More extensively utilize programs for rotating assignments or remote work, allowing scientists to work for government in many ways. Young scientists today are used to changing jobs or even career paths more frequently than my generation, so the civil service of the future must evolve accordingly.
- **Codify scientific integrity policies in law and require that all agencies implement and enforce them.** This will help restore independent science to its rightful place at the heart of government decision-making.

Conclusion

It is critical that Congress and the Biden administration work to strengthen the scientific capacity of our federal agencies. We must ensure that scientific agencies have the capacity needed to meet their missions, that federal scientists are protected from intimidation and political interference, and that science opportunities in government are accessible to the public—especially members of communities that have historically been underrepresented in federal scientific positions. Bringing the experts back to government will ensure that science can protect our environment, keep the public safe, and foster a healthier future for all.

Chairman Foster, Ranking Member Obernolte, and Members of the Committee, I appreciate the opportunity to testify before this Committee to share my views and I am happy to answer any questions.



Andrew A. Rosenberg is director of the Center for Science and Democracy at the Union of Concerned Scientists. He has more than 30 years of experience in government service and academic and non-profit leadership. He is the author of scores of peer-reviewed studies and reports on fisheries and ocean management and has published on the intersection between science and policy making.

Dr. Rosenberg previously served as Chief Scientist at Conservation International, Dean of Life Sciences at the University of New Hampshire and Deputy Director of the US National Marine Fisheries Service

Dr. Rosenberg was also the convening lead author of the oceans chapter of the US National Climate Assessment and a lead author for the UN World Ocean Assessment. Dr. Rosenberg received his Ph.D. in biology from Dalhousie University in Halifax, Canada.

Chairman FOSTER. I have to unmute. Thank you. And next is Dr. Southerland.

**TESTIMONY OF DR. ELIZABETH SOUTHERLAND,
FORMER DIRECTOR OF SCIENCE AND TECHNOLOGY,
OFFICE OF WATER, ENVIRONMENTAL PROTECTION AGENCY**

Dr. SOUTHERLAND. Thank you. Chairman and Ranking Member and distinguished Members of the Subcommittee, I had the privilege of working at EPA from 1984 until August of 2017. With my Ph.D. in environmental sciences and engineering, I worked first as a scientist and then as a manager of scientists in the EPA's water and superfund programs. Thank you for the opportunity to testify today.

While I know that EPA currently has a dedicated team of knowledgeable, highly qualified career professionals, today's staffing levels are the lowest they have been in 30 years. In addition, several hundred career scientists have reported over the past 2 years that their research findings were altered or suppressed for other than technical reasons.

As a result, I believe the complex environmental challenges of the 21st century cannot be successfully addressed unless Congress and the Administration work together to significantly increase EPA's staff levels, and EPA leadership rebuilds the morale of the workforce.

Since my retirement, I've been a member of the Environmental Protection Network, a bipartisan organization of EPA alumni volunteering their time to protect the integrity of EPA and its mission. I am here, however, in my personal capacity.

EPA has experienced years of declining resources with significant loss of buying power and reductions in staff despite the fact that congressionally mandated responsibilities have increased substantially over that time. In terms of inflation-adjusted dollars, Administrator Regan will have 1/2 the resources that the agency had in 1980.

In 2013 and 2014 the Obama Administration gave early out retirements to certain senior scientists in order to reduce grade levels and the dollars for full-time equivalent (FTE) employees. EPA had not backfilled all of those vacated positions when the Trump Administration began. Former President Trump requested huge cuts in the agency staff every year, and his administrators did not authorize any significant hiring until 2020. By 2020, over 670 career scientists had left EPA. While Congress rejected President Trump's requested budget cuts, the Agency's appropriations were basically flatlined during these 4 years, further exacerbating the decline in buying power.

I can tell you from personal experience that managers and staff in the EPA are doing everything they can to compensate for the critically low staff levels, while also struggling with out-of-date information technology and lack of cutting-edge scientific equipment.

The lack of staff and resources has forced EPA to focus primarily on those rules with statutory or court-ordered deadlines. Rules without deadlines, no matter how important for public health and

environmental protection, are often postponed for years or take years to propose and promulgate. One recent example of such a delayed rule is the *Safe Drinking Water Act's* lead and copper rule, which was not updated for almost 30 years, despite the high risk lead poses to our children.

In order to fully restore the workforce, the new Administration should work with Congress to get agreement on a 4-year goal to rebuild EPA's budget to its 40-year average level. This goal would represent a 40 percent increase from 2021 funding levels.

Another key opportunity to restore the workforce is for the new EPA leadership to reinstate the collaborative working relationship with career staff that was lost during the Trump Administration. The new leaders should also move quickly to identify priority hires for entry-level and senior-level scientists, to use all available authorities to speed hiring, and invest in a hiring campaign over multiple years that's focused on hiring 1,000 of the best, brightest, diverse STEM graduates. They must also strengthen staff development and strengthen partnerships with EPA bargaining units.

In conclusion, it is my hope Congress will take concrete steps to provide the necessary funds to rebuild the staff and core programs and to support critical new initiatives addressing climate change and environmental justice. I look forward to answering your questions.

[The prepared statement of Dr. Southerland follows:]

Testimony of Dr. Elizabeth Southerland

Former Director of the Office of Science & Technology, U.S. EPA's Office of Water

Before the House Committee on Science, Space, and Technology

Subcommittee on Investigations and Oversight

March 17, 2021

Chairman Foster, Ranking Member Obernolte, distinguished Members of the Subcommittee, my name is Elizabeth Southerland. I had the privilege of serving in the U.S. Environmental Protection Agency (EPA) from January 1984 until August 2017. With my PhD in Environmental Science and Engineering, I was first hired at EPA as a scientist and then was promoted to manage other scientists. I worked in the Water and Superfund programs at EPA Headquarters and played a major role in developing over 40 regulations and significant guidance documents designed to reduce pollutant discharges to the nation's waterways, clean up hazardous waste sites, and identify the safe level of toxic chemicals in drinking water, recreational waters, fish and shellfish. Thank you for the opportunity to testify today about "Brain Drain: Rebuilding the Federal Scientific Workforce."

While I know that EPA currently has a dedicated team of knowledgeable, highly qualified career professionals, today's staffing levels are the lowest they have been in 30 years. In addition, hundreds of the career scientists at the agency have reported in surveys by the Union of Concerned Scientists and the EPA Office of Inspector General over the past two years that their research findings were altered or suppressed for "other than technical reasons." As a result, I believe the complex environmental challenges of the 21st century cannot be successfully addressed unless Congress and the Administration work together to significantly increase EPA's staff levels, and EPA leadership rebuilds the morale of the EPA workforce.

Today I will give you my thoughts on the challenges that scientists at EPA have been facing over the past decade, the impact of the loss of experienced scientists, the importance of restoring scientific integrity at the agency, and policies that can rebuild the workforce. Since my retirement, I have been a member of the Environmental Protection Network (EPN), a bipartisan organization of 550 EPA alumni volunteering their time to protect the integrity of EPA and the health and well-being of the American people. My testimony incorporates data and recommendations in EPN's *Resetting the Course of EPA*,¹ but I am here in my personal capacity.

¹ Environmental Protection Network. *Resetting the Course of EPA*. (<https://www.environmentalprotectionnetwork.org/reset/>) (August 2020).

Challenges to Federal Scientists

Data from the Environmental Protection Network show that EPA has experienced years of declining resources, with significant loss of buying power and reductions in staff despite the fact that congressionally mandated responsibilities have increased substantially over this time. In terms of inflation-adjusted dollars, Administrator Regan will have half the resources the agency had in 1980, a year that predates the 1984 Resource Conservation and Recovery Act reauthorization, the 1986 Superfund reauthorization, the 1987 Clean Water Act, the 1990 Clean Air Act Amendments, the 1996 Safe Drinking Water Amendments, and the 2016 Toxic Substances Control Act Amendments.

In the past decade, between 2010 and 2020, the Environmental Programs and Management account that funds EPA's regulatory and enforcement staff dropped 31%, the Science and Technology account that funds research staff dropped 40%, and the Superfund account that funds remediation staff dropped 29%, all in real dollars.

In 2013 and 2014, the Obama administration gave early-out retirements to certain senior scientists in order to reduce grade levels and reduce the dollars per full-time equivalent (FTE). EPA had not backfilled all of those vacated positions when the Trump administration began, so staff levels were already at a historically low point in 2017.

President Trump requested huge cuts in the agency's staff every year, and his EPA administrators did not authorize any significant hiring until 2020. By 2020 over 670 scientists had left EPA. While Congress rejected President Trump's requested budget cuts, the agency's appropriations were basically flatlined during the Trump administration, further exacerbating the decline in buying power.

I can tell you from personal experience how EPA career staff have tried to compensate for the critically low staff levels. All managers do a significant amount of technical work themselves on nights and weekends so during office hours they can focus on supervision, mentoring, budget, and work planning. All managers and technical staff do many of the administrative tasks themselves since the agency has reduced the support staff to the lowest possible level. These administrative tasks are so time-consuming they reduce productivity and hurt morale. Because of the lack of funding, managers and staff also struggle with out-of-date information technology, and laboratory and field scientists often lack cutting-edge monitoring and analysis equipment. Despite valiant efforts to compensate, the lack of staff and resources has forced EPA to focus primarily on those rules with statutory or court ordered deadlines. Rules without deadlines, no matter how important for public health and environmental protection, are often postponed for years or take years to propose and promulgate. One recent example of such a delayed rule is the Safe Drinking Water Act's lead and copper rule which was not updated for almost 30 years despite the high risk lead poses to children. Significant guidance documents are also subject to postponement or take years to

complete. Recent examples of delayed guidance documents are toxicity assessments for the perfluorinated “forever chemicals” that contaminate drinking water throughout the country. Despite EPA declaring in 2018 that toxicity assessments for two of these chemicals were an agency priority, neither has been completed at this time.

Impact of Loss of Experienced Scientists

EPA is responsible for administering over 20 environmental laws and is affected by a number of other related statutes. Scientists at the agency are engaged in many different types of work under all those laws. Scientists in EPA’s Office of Research and Development conduct basic research on the ecological and public health effects of pollutants and on innovative treatment and remediation technologies. Scientists in the other EPA offices analyze the world’s scientific literature in order to set national standards for clean air, water, and land and to regulate pesticides, toxic chemicals, and hazardous wastes. They conduct engineering evaluations to develop technology-based treatment standards and remediation procedures, and they monitor and assess air, water, and land pollution.

A 2019 Office of Management and Budget (OMB) Report to Congress documented how effective these scientists have been. OMB estimated the annual benefits of 39 EPA regulations promulgated between 2006 and 2016 ranged from \$194B to \$687B, far outweighing the costs to polluters, which were less than \$55B. The American people cannot continue to enjoy such tremendous benefits unless experienced scientists in adequate numbers are employed at the EPA, and today there is not an adequate number of experienced scientists at the agency.

Importance of Restoring Scientific Integrity

EPA’s Scientific Integrity Policy was released in February 2012. The Office of Inspector General (OIG) conducted an audit in 2018 to determine whether the policy was being implemented as intended to ensure scientific integrity throughout the agency. The OIG published the disturbing results of that survey in a May 2020 report entitled “Further Efforts Needed to Uphold Scientific Integrity Policy at EPA.” The report includes the following:

- 705 respondents said they feared retaliation if they expressed a scientific opinion about the agency’s scientific work;
- 624 respondents believed the management chain did not stand behind staff who put forth scientifically defensible positions;
- 368 respondents reported research findings being altered or suppressed for other than technical reasons;
- 1,166 respondents indicated they did not feel comfortable reporting instances relating to the loss of scientific integrity; and
- 400 respondents said they had not reported violations of the scientific integrity policy because of fear of retaliation and belief that the reporting would make no difference.

Clearly, EPA cannot protect the health and welfare of the American people if the career scientists are silenced or ignored. It is imperative that the new administration revive and strengthen the scientific integrity policy at EPA and at all federal agencies. I would note that passage of the Scientific Integrity Act would provide federal scientists with government-wide protection.

Policies to Restore the Workforce

In order to fully restore the workforce at EPA, the new administration should work with Congress to get agreement on a four-year goal to rebuild EPA's budget to its 40-year average level (\$11.4B in 2019 dollars). This goal would represent about a 40% increase in the 2021 budget. Michael Regan's confirmation was a major accomplishment, but the new administration and Congress must promptly fill all the key leadership positions with experienced executives so the EPA workforce can focus as soon as possible on the agency's new priorities. President Biden has already announced plans to prioritize and bolster scientific integrity across the federal government in several Presidential Memoranda and Executive Orders. New leaders at EPA will be most successful when they work as quickly as possible to build trust and communication with career managers and staff. Unlike the previous three administrations, the Trump administration did not maintain collaborative working relationships between political appointees and career staff based on the free exchange of ideas. The new leaders need to reinstate that collaborative approach, once again including career staff in decision meetings and welcoming their input.

Specifically, EPA's new leaders should initiate a number of critical actions in order to recruit and hire the next generation of professionals, with an eye toward diversifying the agency's staff and leadership. There is a plethora of diverse talent both inside and outside the agency, and dedicated steps need to be taken to recruit, hire, and train these individuals so EPA can better reflect the diversity of the constituency it serves. First, the new leaders should expand successful past EPA workforce planning and analysis programs to cover all offices so they can identify priority hires for both entry-level and senior-level scientists. Second, they should review and strengthen the agency's hiring program to ensure all available authorities are being used to speed hiring, including the 2018 STEM authority for the direct hire of scientific, technical, engineering, and mathematics positions. To fill entry-level positions, they should increase funding for the Pathways, Presidential Management Fellowship, and Science to Achieve Results Fellowship programs. To fill the most senior scientist positions, they should continue to use the Title 42 hiring authority to directly recruit and hire world-renowned scientists with outstanding scientific and technical skills. They should also review and strengthen the agency's recruitment program by investing in a hiring campaign over multiple years that is focused on hiring 1,000 of the best, brightest, and diverse STEM graduates of universities. Third, they must strengthen staff development by providing enhanced training, cross-program assignments, and state-of-the-art scientific equipment and information technology. Fourth, they need to strengthen

partnerships with EPA bargaining units to address important workforce issues and support an inclusive workplace.

Conclusion

The complex challenges of public health and environmental protection in the 21st century cannot be successfully addressed unless EPA leadership rebuilds the capabilities, productivity, and morale of the EPA workforce and creates a more inclusive workforce that reflects the communities EPA serves. While the historic challenges cannot be overcome quickly, it is my hope Congress will take concrete steps to provide the necessary resources to increase funds for core programs and to support new initiatives addressing climate change and environmental justice.

Thank you for this opportunity to share my thoughts.

Dr. Elizabeth Southerland (USEPA—retired)

Dr. Southerland retired from the USEPA in 2017 as Director of the Office of Science and Technology in the Office of Water following a 40-year career as an environmental engineer/scientist for Federal, State and local environmental protection agencies, including 33 years at USEPA.

At USEPA, she led or made major contributions to water quality management, drinking water protection, and hazardous waste site clean-up programs. She led the development of national regulations and guidance manuals; coordinated and negotiated with state environment agencies, industry representatives, and environmental groups; and testified before Congressional committees. Her accomplishments include the development of the following influential rules and guidance documents: the first federal controls on toxic wastewater discharges from coal-fired power plants; the FDA-EPA national fish consumption advisory on mercury contamination; national drinking water health advisories for harmful algal bloom toxins and the toxic “forever chemicals” PFOA and PFOS; and a systematic approach for deriving hazardous waste cleanup standards. In 2015, Dr. Southerland received the Distinguished Presidential Rank Award for her career at USEPA.

Prior to joining USEPA, Dr. Southerland led stormwater pollution control programs for the Virginia State Water Control Board, and she managed the development of the first water quality model of the Chesapeake Bay Watershed (covered 6 states and 64,000 sq mi) while completing her PhD research.

She received her PhD in Environmental Science and Engineering from Virginia Tech which inducted her into the Academy of Distinguished Alumni in 2013.

Chairman FOSTER. Well, thank you. Thank you all. And at this point we'll begin our first round of questions. So the Chair will recognize himself for 5 minutes.

Before we get started, I have statements here from the American Federation of Government Employees, Local 3403, representing NSF employees in STEM fields, and from the Climate Science Legal Defense Fund to be entered into the hearing record. Without objection, so ordered.

I guess, you know, I concur with, I guess, all of our witnesses here that the Federal Government needs to embrace a more innovative and proactive approach in hiring and recruitment efforts, especially for young and diverse scientists. You know, there are really I think a real hunger among this generation of scientists coming out of the—our educational system to do something in public service. And they're—they really—you know, this is something I've had many discussions with about—professors. They said you should have a job fair or something like that to—you know, just to make this generation of scientists aware of the really tremendous opportunities.

And I think it's also underappreciated how influential an excellent scientist can be with a career at least partly in the Federal science oversight business because you have—you know, you have a tremendous influence that's not often appreciated even by the scientific community. And so this is really for—I guess for everyone on the panel. And how can things like job fairs enhance fellowship programs, streamline hiring procedures, and reduction of bureaucratic obstacles? What are the most promising initiatives here to really accelerate the rebuilding of the scientific workforce?

Mr. Stier, it looked like you were full of ideas here, so we'll start with you.

Mr. STIER. You're very kind. Chairman Foster, I think it's an excellent question, and my advice would be to not think about this as an individual intervention but rather think about a comprehensive strategy. The reality is the system is breaking down along multiple points, and unless you actually deal with the full set of system failings, you'll wind up maybe improving the situation but ultimately running into another barrier simply further down the pike.

So absolutely career fairs are great if they're done at the right time. Oftentimes, Government comes in the spring rather than the fall when a lot of talent is actually thinking about what they want to do. But if the people coming to those fairs or even people more broadly at the university haven't been introduced to the opportunities that exist in government, if they're instead thinking about a brand that has been tarnished, then you haven't helped yourself a lot. If the process of hiring is so difficult that even if they're interested once they get to the career fair they're turned away, that's a big problem. If they ultimately get hired and they leave quickly, then you simply created a bad brand for the broader set of peers that they have.

So I think it's really important to be comprehensive in thinking about how to put your arms around this problem and to see it as a governmentwide issue for the STEM occupations and to create that governmentwide strategy that individual agencies can partici-

pate in but that they can collaborate in. Certainly, there are things you can do in the meanwhile, but I think if you really want to move the needle and recognizing the world is changing, you need to actually address all those pain points along the lifecycle of bringing talent in and keeping it.

Chairman FOSTER. Yes. Dr. Rosenberg?

Dr. ROSENBERG. I certainly agree with that. I also think that we sometimes—we hurt ourselves with the rhetoric that's used around working for the Federal Government. It is really public service, and you get to do great science with great colleagues, but we need to help people understand that it really is a public service job. You are serving the country.

I also think we sometimes hurt ourselves by implying that there is a reduced pipeline. There actually isn't a reduced pipeline, and it is very diverse, but we don't recruit fully from that pipeline. So I mentioned recruiting from minority-serving institutions, for example. There are literally thousands of engineers, you know, Black engineers—we work with the Society for Black Engineers who work with a lot of historically Black colleges and universities. There are many, many highly trained engineers and other STEM fields across the country, but we're not reaching them because we go back to the same places to look for staff over and over and over again.

And then, as the Ranking Member noted, our recruitment methods and onboarding procedures are really archaic. And I know this as a government management from years ago. I also know it from my students when I was in academia subsequent to that. You know, the mechanisms for bringing people onboard erect so many barriers that by the time a real offer is in place, then they've had other offers if they're really excellent talent and really want to move forward.

So a lot of these are self-inflicted wounds. It's not because there aren't people. There is a very diverse workforce that we could bring onboard. It's just we're not doing it effectively.

Chairman FOSTER. Thank you. And I guess my time is up, so I'll now recognize Mr. Obernolte for 5 minutes.

Mr. OBERNOLTE. Well, thank you very much. And thank you to all of our witnesses. This has been a fascinating discussion.

My first question is for Dr. Rosenberg. In your testimony you implied a causal relationship between the policies of the Trump Administration and the declines in scientific staffing at the EPA. And you mentioned the statistic that the scientific workforce at the EPA declined by 3.9 percent during the Trump Administration, but looking at a broader set of statistics, between 2009 and 2020, the scientific workforce at the EPA declined by about 16.6 percent. So on an annualized basis, those declines were higher during the Obama Administration than they were during the Trump Administration.

Now, I don't find that comforting. I find that alarming because that tells me that this wasn't an isolated incident just tied to the policies of one Administration. This is a long-term trend. So, I mean, do you share that concern? Is this isolated or is this long-term trend that we need to be concerned with?

Dr. ROSENBERG. Well, I do share the concern that it's a long-term trend, and I did only very briefly mention the role of demographics in the staffing at agencies. So several things have happened at

once, and I firmly believe that the policies of the Trump Administration, if you like, harmed the brand in those terms. But we also have many scientists of my generation if you like—I'm going to be 66 in a month or so—that are going to leave the workforce anyway. The question is do you replace them or do you replace them only with contractors? And so many previous Administrations have shifted to using contract staff. And while that in some cases can be efficient and it might be short-term cost-effective, it actually doesn't help build the strength of an agency to do the long-term work because contractors are always looking for the next opportunity or more permanence. And so this is a long-term trend with multiple factors involved.

Now, the Trump Administration isn't the only Administration that has had challenges on certain issues related to things like scientific integrity, the ability of scientists to do their work without political manipulation or censorship, but it was a more extreme circumstance. So all of those combining factors I think are things that need to be addressed to try to stabilize and improve the workforce. Now, that doesn't mean that every scientist coming in will be a 30-year Federal employee because that's not the way people go into their jobs these days. So we need to think of alternative ways for people to move in and out of government. And I happen to be one person who has moved in and out of government, and it's possible but difficult.

Mr. OBERNOLTE. Great. Thank you. I completely agree with you.

And just following up on that, a question for Mr. Stier. You said something that I found absolutely fascinating about how we need to rebuild the Federal brand and make sure that our Federal branding is helping us recruit the talent that we need to. And I think Dr. Rosenberg just mentioned something along that same line. So I kind of think that we miss out sometimes on the opportunity to, as Dr. Rosenberg said, play up the fact that we are in the business of public service, so in addition to being able to do great science, we get the opportunity to serve our fellow constituent, you know, in ways that are impossible to do in academia and in the private sector.

So I just wanted to give you the balance of my time to talk about how we might go about restoring that brand and burnishing that brand because I think it's extremely important.

Mr. STIER. Thank you so much, and I think you're 100 percent right. If you look at the data, our Best Places to Work rankings, what you'll see, as I mentioned earlier, that relative to the private sector, the employee engagement scores are on average 15 points lower in the Federal Government than they are in the private sector. But if you look at the mission commitment, it's the one place where the Federal workforce wherever you are, NASA, NOAA, NIST (National Institute of Standards and Technology), it just beats the private sector in—with a very big margin.

The government has something very special, and it's the reasons why you're all here as well is the ability to serve the American public, purpose, mission, and that mission is really the basis for an incredible value proposition. If you wanted—you look at, bluntly, the contractor firms, they try to present their mission as what the government should be doing. You're serving the American public,

that's why you're here and on and on. So the government is not utilizing its core value proposition, and it needs to do that in a concentrated way. And part of the way it can do that is by telling the story of its own workforce. You think about the amazing people helping the American public in extraordinary ways, innovative ways. Those stories don't go out to the public. They don't even go out to the broader workforce inside the Federal Government. We do not have a recognition culture in government. There's a lot of infrastructure to find a problem, not a lot of infrastructure to find the good things. You actually build more strength and deal with your weaknesses if you have an upside and if you create that recognition culture. So that's where I would begin. Begin from the core strength around mission and around the achievements of the people that are there. Stories matter, and the government has a lot of them that we need to tell better.

Mr. OBERNOLTE. Right, thank you. I completely agree. And just to tie into my opening, I think we need to be more entrepreneurial in our approach to recruiting top talent. We are never going to be able to compete in terms of salary with institutions in the private sector, but we do have a unique advantage in the mission that we fulfill, and I think that's why we're all in government is this desire to serve our fellow man.

So I want to thank you to all of our witnesses. It's been a fascinating discussion.

Chairman FOSTER. Thank you. And I will now recognize our colleague from Colorado, Mr. Perlmutter, for 5 minutes.

Mr. PERLMUTTER. Thanks, Mr. Chairman. And the Ranking Member, I appreciate the comments of both of you. And just a point, Mr. Obernolte said, you know, competition against the private sector, competition against academia, there's also competition with foreign governments. And we can't forget that. And I'll get back to that in a second.

But my first question is to you, Director Wright and to you, Dr. Rosenberg. You talked about contractors. And in my area we have the National Renewable Energy Lab, we have NIST labs, we have all sorts of labs, and we've seen the contractor population really grow. Is there a reason for that in terms of the law or what is it that's driving this move from civilian employment to contractor employment if you could? And start with you, Director Wright.

Ms. WRIGHT. Thank you for that question, Congressman Perlmutter. So I would say that, you know, with regard to contractors, there could certainly be a more lucrative opportunity financially that they may see, you know, working in a contracting—contractor environment rather than in the Federal Government.

You know, our work certainly has shown, you know, that you really have to have good practices in place to retain employees so that they will feel a commitment to the mission, commitment to the work, and not necessarily, you know, just be focused on the financial aspects. You know, there is certainly the opportunity to really hone in on what the function of the government's mission is for the employees, and they might then, you know, consider Federal employment rather than, you know, pursuing opportunities with a contractor.

But I think Dr. Rosenberg had touched on the contractor issue, so I'll defer to him for additional comments.

Mr. PERLMUTTER. OK. Thank you.

Dr. ROSENBERG. Thank you for the question, Congressman. I think there's a number of factors at play. Every Administration that I've been involved in, which is, you know, the last—going back to the first Bush Administration when I was in Federal Government beginning my Federal service—has wanted to be able to point to statistics showing that they've decreased the size of government. And one way you do that is you have fewer full-time employees but you replace them with contractors. And so there's a political reason here I would say, although you're a better judge of that than I am.

There also is a reason around the concern for pension obligations of course and for flexibility in staff as budgets go up and down, and so stability and agency budgets is an important part of this as well.

And more importantly every other sector, including the nonprofit sector and certainly the for-profit sector, is sort of thinking about jobs as what are the things that we need to do and we know we're going to need to do tomorrow and we're going to need to do in the long-term, and what are those things that are shorter-term and we need more flexibility to do them? And the government often doesn't do that.

So you hire more contractors at places like national labs and within the agencies even for long-term tasks because you're not allowed to bring on full-time employees under the hiring system because of the way that budgets are constructed and FTEs are allocated. And that does cause real problems because those scientists are going to look for more stable opportunities, and I know many young scientists who come in as contractors, and that unfortunately is their situation. They're always looking elsewhere.

Mr. PERLMUTTER. All right. Thank you. Let me ask one more question of Mr. Stier. I noticed that you worked for Jim Leach, and then you clerked for a Judge of the Second Circuit and the Supreme Court and you also touted internships. So do you want to expand on why you think internships or clerkships are important for recruiting talent?

Mr. STIER. Absolutely. And if I could for 2 seconds I just want to add that on the contractor point it's often a workaround. If the hiring system is broken, the only way you can get your talent is through contracting. It's obviously not the right motivation, but it's really important to understand that so much in government is about working around a crazy system, and this is an example of it.

Internships, to your question, is a very important issue. If you look at any knowledge-based organization in our country, they get their entry talent primarily through internships. That's true whether it's in the law like you just mentioned. It's true if you work on the Hill. It's true if you're an economist. It's true everywhere. That's not true in the executive branch, and that's a big problem. By and large, interns are not seen as a core piece or the core piece of the entry pipeline in the Federal Government, and if anything, the number of folks that are converting from internships into full-time employees has been—is being reduced.

Some of this has to do with the fact that, again, leaders don't own this, they don't see it as their responsibility, and as a result, they're not focused on the longer-term pipeline that they ought to be paying attention to. Some of it is just bad rules.

Mr. PERLMUTTER. Mr. Stier, sorry, my time is expired. I appreciate—I'm going to probably send you a note wanting you to expand on the internships. Thank you, Mr. Chair, for that extra time. I yield back.

Chairman FOSTER. Thank you. And we will now recognize our colleague from Texas, Mr. Sessions, for 5 minutes.

Mr. SESSIONS. Mr. Chairman, thank you very much, interesting discussion. I don't believe I have a different perspective than any of the other Members here, nor do I think I have a different perspective, but I'd like to throw some things in that simply acknowledge the parameters that we've been talking about. I am well aware that we either made a mistake or we did not when we made the R&D (research and development) tax credit permanent. That meant that companies that could not count on their R&D budget being a part of their regular write-off as an expense changed overnight, and companies began hiring long-term employees. That competed against a lot of universities, against a lot of medical institutions because the Federal Government does not in my opinion pay anything that would be an end-of-year bonus that competes with stock options or other things that other people provide.

My point is is that we've got institutions, medical institutions, we've got other areas, universities that just bust their hump to get what they need. And the numbers of people that are out there who are qualified is the issue.

And that's why I think, as I recall Ed, Dr. Bera, perhaps you, too, have been involved in science-based projects back in junior and senior high levels, Odyssey of the Mind, these robot competitions, things that bring people to science in 7th, 8th, 9th, 10th grade with equivalent feel-good success stories that continued them through this process.

My son, who's now 31, went to one of the leading-edge institutions, private school, was a 35 out of 36 and was about midrange of his class. A number of people just—was a great school. He's the only one that chose to go into medicine. Everybody else chose to go where they could make money.

And so the opportunities that we need to understand I think, yes, they're in internships. I do agree with that, but we also I think need to robustly have, Mr. Chairman, someone who can tell us about the pipeline, about the pipeline of the types of contests—yes, I said that word, but they might be generated through competitions that bring these leading-edge people to want to build something better and see what the competition is through—and some of it is just double E, electrical sciences, but I think we ought to hear from people who also do understand the pipeline, junior high, high school, but, you know, I also think that, as I went to the labs in New Jersey, I was on the hiring team, and I'll just tell you, we went to University of Chicago, we went to MIT (Massachusetts Institute of Technology), and we went to Caltech, and we honed our science of what we were after. And I think that these institutions

produce leading-edge people. We just need more people in the pipeline.

So I don't know if anybody, Elizabeth, you may have something on there. Andrew, you may have that—the young doctors that are here, but I really want to focus on the pipeline. Yes, we need to do a better job with the internships, but we really need to build the number of people who want science as opposed to us grinding each other down on the few that we get. Thank you, Mr. Chairman. I'll let panel take the remaining 2 seconds that I have.

Chairman FOSTER. It seems like 40 seconds are sort of *de rigueur* here, so if anyone wants to grab 40 seconds, that's legit. All right. Dr. Rosenberg.

Dr. ROSENBERG. Thank you. And thank you for the question. I actually think that the pipeline is much bigger than people appreciate, but as you noted, Congressman, the—you know, if you go to the University of Chicago and MIT and Caltech and you keep going back to those places, you're only looking at a limited portion of the people who actually do STEM work.

On the other hand, you know, Texas Southern has great engineering and science programs. All of the Houston schools actually, you know, train scientists. But many agencies and many scientists only go back to the places they know repeatedly or the places that they were trained, and that's a very natural tendency. But—and I've seen it in every institution that I've worked in. But it does us a disservice when you're trying to expand the opportunity for candidates across a much broader set of institutions to think that it's only the elite institutions that are training people who could do the job, and so that's part of it.

Chairman FOSTER. I think the 40 seconds of forbearance are sufficient.

Dr. ROSENBERG. OK. Sorry. Sorry.

Chairman FOSTER. Thank you. I'll now recognize our colleague from California, Dr. Bera, for 5 minutes.

Mr. BERA. Great, thanks, Mr. Chairman. And this is fascinating and certainly a long-term challenge. You know, one idea that we've toyed with and, you know, as we think about the debate that's taking place around student debt and whether you retire student debts, I've always thought that, you know, instead of just retiring that student debt and forgiving it, we ought to use that as a mechanism to try to get folks to serve, whether that's, you know, coming to work in the Federal Government fulfilling critical needs or going out and doing service, you know, through some other mechanism like the Peace Corps, AmeriCorps, or other programs. And, you know, again, I don't know that we get any benefit of just forgiving \$50,000 of loans or \$100,000 of loans, but if we could get someone to come fill a critical need and perhaps they work for 4 years and you forgive \$50,000 or \$100,000 of loans. By that time they have seen what they can do in the Federal Government. You know, they're accruing retirement, they're doing some things, and hopefully you can get a cohort of those young Americans to continue to stay and consider a career in the Federal Government. So that's one thing. And I think we ought to work on that as a Subcommittee perhaps to address this critical need and, you know, do something in a bipartisan way.

The second piece that, you know, we've thought a lot about is there is a talented workforce that has been serving our country in the military and in our armed services often doing high-level skills perhaps without a degree, but they're operating, you know, doing cybersecurity work, et cetera. They've learned on the job. When they leave the military, the challenge sometimes is we don't actually recognize and put a value on that skill set. I know most closely in the medical workforce where if folks are operating as EMTs (emergency medical technicians) and—but they don't actually have that formal degree, so now they come out, we don't actually provide a value to that. We may ask them to go back and get a 4-year college degree so then they can enter the workforce. I think it behooves us to think about ways to take some of these folks as they're exiting military service perhaps to figure out how to value that, bring them into government service, you know, provide some training while they, you know, continue to work, and I think that's also another potential pipeline of folks that, you know, have already demonstrated a commitment to serving the country and now, you know, we could do them a service by giving them a job, getting them—and perhaps while they're working, continue to upskill them.

I guess, you know, to any of the panelists, you know, thoughts on, you know, whether the idea of student loan forgiveness, should—

Ms. WRIGHT. So—

Mr. BERA. I guess Mr. Stier if you want to—

Ms. WRIGHT. OK.

Mr. BERA [continuing]. You know, take that.

Mr. STIER. Ms. Wright, do you want to go first, and then I'll go after you?

Ms. WRIGHT. OK. So I was just going to note that, certainly, the student loan repayment is one of the pay authorities that agencies are using, and they do say that it's—you know, in our work we've heard from agencies that they do say that it is working well. What we don't know is the extent to which it's working in terms of how long—you know, what does it say about how long people will stay at the agency, and so that's something that we've called on OPM to, you know, look at the effectiveness of these various pay authorities and to understand the extent to which it is working and making an impact in recruitment and retention.

Mr. STIER. So just to follow up on Ms. Wright's comments there, there is authority. Agencies use it very unevenly and in my view not nearly enough. There's clearly more work, as Ms. Wright [inaudible] understand how effective is, but anecdotally we're seeing that this is a major deal for talent to be able to have their debt forgiven and by and large, again, there are very few agencies that use it to the extent they could.

If you want to think about this even more ambitiously, you—I think there is room to create a program like the ROTC (Reserve Officers' Training Corps) program that the military has for the civilian side where you're actually getting talent to come in with that service payoff commitment. You're helping them pay for their education while they're getting it with the expectation then that they will come serve their country in the government. And we've done

a bunch of work around this and would love to talk to you if you're interested in that as a concept.

Mr. BERA. Absolutely. We will follow up on that.

So anyone else in the last 18 seconds? Dr. Rosenberg?

Dr. ROSENBERG. Yes, I would just point out that many students that I talk to would like to go into public service, are more interested in the academic sector, which has become less attractive. And they want to do—you know, work for government because they want to make a difference, and it—you know, money is important, but there are huge barriers particularly for lower-income students to doing so, not only student loans but the ability to—for compensation on things like internships and fellowships, and that actually needs to be addressed so that you can, again, diversify the workforce but also just a bigger talent pool of people who can actually afford to take these opportunities.

Mr. BERA. Great, thank you, Chair, and I yield back, Mr. Chairman.

Chairman FOSTER. Thank you. And we will now recognize the Ranking Member of the Full Committee, Mr. Lucas from Oklahoma, for 5 minutes.

Mr. LUCAS. Thank you, Mr. Chairman. Ms. Wright, in your testimony you note that in October of 2020 GAO reported that various factors such as unclear job application processes, long wait lines for job offers have been identified as contributing to the Federal Government's workforce deficiencies in certain areas and job categories. Can you please elaborate on these findings and how they relate to the USA Jobs portal?

Ms. WRIGHT. Certainly, happy to take that question, Congressman. So I would say with regard to USA Jobs, it's certainly something that many people would say isn't the most user-friendly experience, and GAO actually did work, as you noted last year, looking at what steps OPM is taking to improve the website.

Certainly, a couple of things that we identified is that they have really taken a step looking toward looking at using data analytics, using web analytics I should say to understand where their users are coming from but also, too, putting in place different features that would allow you to understand—allow the applicant, I should say, to understand, you know, what the status is of their application because that was something that they were getting a lot of calls on.

There are other things that OPM is considering to help improve the experience with USA Jobs, which would include, you know, letting applicants know how many other applicants have applied and then also notifying applicants when jobs have been filled, so that's something that they're continuing to work on for the future. They recognize it's a problem, and are taking steps to try to improve the system.

Mr. LUCAS. Is it true that sometimes it can take an average of 90 days or more for new hires to be onboarded?

Ms. WRIGHT. We've certainly heard those average timeframes. I think one of the challenges is sort of understanding when one starts the clock for estimating the onboarding time. One of the things that we've heard is that is consistently a challenge is—and contributes to the delays are security clearances. That's something

that GAO has reported on, you know, quite a bit in terms of the challenges with getting personnel security clearances on time, and we can see where that is contributing to delays in onboarding.

Mr. LUCAS. Mr. Stier, can you provide some insights on how this may be discouraging especially to recent graduates and early career researchers just entering the workforce?

Mr. STIER. Yes, absolutely, I think it is a massive problem, and it's not only the time to hire which you've identified and it's a big problem. Great talent is going to have options, and they're going to take the option that is easier for them and more available than wait, especially when they don't know how long it's going to take. So there's no doubt that the government is losing out on a lot of talent.

I would note that there are other problems beyond that, including the fact that 90 percent of the job searches involve simply the review of self-reported qualifications or the resume, not actual subject matter experts looking at their resumes and talking to people to determine if they are in fact best qualified for the jobs. And then 50 percent of the searches wind up getting sent back and never even actually used. This is a deeply broken problem. The front door of USA Jobs is the starting point, but then there are a series of issues where this process breaks down that also have to be addressed.

Mr. LUCAS. So it's fair to say that some of the brightest people in the country who may very well have many job opportunities, potential choices become essentially frustrated even at the very beginning, let alone before they become a part of the Federal process.

Mr. STIER. Absolutely.

Mr. LUCAS. I can see why that would be so discouraging.

Staying with you, Mr. Stier, for a moment, I know we discussed a variety of topics this morning, but you acknowledge that internships are a critical component of the talent pipeline and confirm that Federal agencies should strategically recruit and hire college students, but you also emphasize the benefits of reaching future scientists earlier in their lives. Can you touch for a moment about how STEM education and exposure to the work of Federal scientists provides fundamental experiences for students at an early age, perhaps maybe even in elementary school?

Mr. STIER. Sure. And I think Congressman Sessions had it absolutely right that, you know, there is definite need for the Federal Government to do better in its recruiting and retaining top STEM talent, and we need to increase the pipeline more broadly for our country writ large. And the way you do that is starting earlier.

I would say the role model here is NASA. You know, you hear from Charlie Bolden. You know, he participated—former NASA Administrator for 8 years, astronaut. He did stuff early on in his education. It's the way that the best-in-class organizations actually encourage and improve their brand is to touch people very early on, and there are great ways for the Federal Government to do that.

Mr. LUCAS. I'd say thank you to all of our witnesses, and I yield back, Mr. Chair.

Chairman FOSTER. Thank you. And the Chair will now recognize my colleague from Illinois, Mr. Casten, for 5 minutes.

Mr. CASTEN. Thank you to my colleague from Illinois and our Chairman, and thank you so much to our panelists.

The—Dr. Rosenberg, I want to start with you and specifically about a report that UCS did in 2018 in part because it jibed so closely with my own experience in conversations with a lot of EPA staff. You have a report that was detailing the crisis of morale in certain Federal scientific agencies and specifically if I got this right nearly 1/3 of the respondents at EPA felt that, quote, “influences of political appointees in your agency or department or the influence of the White House were the greatest barriers to making science-based decisions at that agency.” And it seemed to have a pretty clear impact on morale. In 2018 less than 15 percent of EPA scientists surveyed by UCS indicated that their morale was excellent or even good, and that compared with nearly 40 percent who felt that way in 2007. As I mentioned, that was extremely consistent with the conversation I had—conversations I had informally with folks at EPA.

Could you just chat a bit with us about how scientific integrity violations and the politicization of science have contributed to staffing losses at those agencies, and I guess on a more optimistic side how a scientific integrity statute could help in retaining good scientists?

Dr. ROSENBERG. Thank you for the question, Congressman. And you very accurately cited our survey results. And I should point out that we’ve been surveying Federal scientists for many years now. This was not a one-off efforts in 2018, and so we had the ability and have published the comparisons to previous surveys.

A couple of things happened. Certainly, the politicization of science was a concern with reports being altered or censored, and I think Dr. Southerland can speak to that very directly particularly at the EPA but not exclusively at the EPA. You may have seen the report yesterday that in an investigation at the CDC at least three major reports during the course of the pandemic were altered by political appointees or outside actors during the course of the pandemic that related to things such as school opening. But at the EPA either science was completely sidelined or censored or manipulated. It became a recurrent problem. And the second part of that problem was that for many decisions, the career professionals were not even in the room, were not even involved in the decisionmaking on some of the issues that we worked on. And I can see Dr. Southerland nodding, and she may want to expand on that.

So scientific integrity policies, if they are strengthened and codified in statute, can actually give scientists a way to ensure that their scientific evidence will not be politically manipulated. And while that’s been articulated by the Presidential memorandum, it’s not codified in statute right now, and so it could be backed away from in many cases or is less—carries less weight than if the *Scientific Integrity Act* went through. So that gives scientists more assurance that the work that they do will actually be—present—the evidence that they gather will actually be presented as scientific evidence, not be manipulated for other reasons. Now, lots of other things go into decisionmaking, but you shouldn’t manipulate the scientific evidence to justify a decision.

Mr. CASTEN. So I know we're short on time, so let me put this—and I know that you have given a few shoutouts to Dr. Southerland, so let me just put this to either one of you who would like to answer. We need to atone for the sins of the past, but we also have to deal with the realities of where we are. And as we think about how to restore this workforce—and, again, my own experience is that, you know, we lost some good and senior talent. So how much of what we need to do going forward is attracting people back when they have left the agency early versus bringing new people in to fill those slots? And what does that mean? Because preparing for the workforce of the future is of course a little bit different than attracting people back who are late career stages. And if—I'm just curious if either of you have any comment about which of those you think is more important to prioritize given the set of cards we have dealt however much we may not like—

Dr. SOUTHERLAND. So I think I'm finally unmuted by the host. I'm having a lot of trouble with verbal. I think the important thing will be to get the new employees. What we can do with people who have left is we have the ability to bring them on even as temporary mentors or part-time employees that can help restore the institutional knowledge at the Agency. But I think the real emphasis needs to be to get us new, qualified young people who can really revitalize the mission.

Mr. CASTEN. Thank you, and I yield back.

Chairman FOSTER. Thank you. And as we bring this to a close, I'd like to recognize the Ranking Member, Mr. Obernolte, for some brief closing comments.

Mr. OBERNOLTE. Thank you, Mr. Chairman, and thank you to all four of our panelists. This has been an incredibly helpful discussion. I think we all share a unified belief that we need to enhance the role of scientists in our Federal workforce and to create an environment that is welcoming to them and that can be successfully competitive against the other entities that are seeking to hire this talent as it comes out of our schools and universities. So let's definitely continue this discussion as things move forward. I think there are lots of excellent ideas raised here today, we stand with you unified ready to try and implement some policy changes that will help us enhance the competitiveness of the Federal Government in that respect. So thank you, everyone. Happy St. Patrick's Day.

Chairman FOSTER. Thank you. And I'd like to reiterate our thanks to the—to our witnesses, you know, not only for your verbal testimony but the really high-quality written testimony, as well as the documents that they referred to. I confess I stayed up way too late last night reading your written testimony, and, you know, I commend it to my colleagues and their staff really because this is something that Congress and this Committee is going to have to come back to repeatedly, that when we hopefully come up with a plan to double the overall scientific effort, that that is accompanied by a plan to overcome the near-term emergency issues, as well as the structural changes to ensure that we have the strongest possible scientific workforce in our—for our government.

So I thank you all again, and before—and so the record will remain open for 2 weeks for additional statements from Members for

any additional questions to the Committee that they may have for our witnesses. The witnesses are excused, and the hearing is now adjourned.

[Whereupon, at 11:20 a.m., the Subcommittee was adjourned.]

Appendix I

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mr. Max Stier

Response to Question for the Record from Rep. Perlmutter

Max Stier, President and CEO
Partnership for Public Service

March 17, 2021 Hearing: “Brain Drain: Rebuilding the Federal Scientific Workforce”

1. In your testimony, you touted the importance of internships. Can you expand on why you think internships and clerkships are important to recruiting talent?

Outside the government, many high-performing organizations use internships to recruit and evaluate talent. The federal government, though, lags in its use of internships to build a pipeline of talent. For example, use of the federal Pathways intern program, which should be a main pipeline into federal service, has plummeted. According to the fiscal 2020 budget request, the number of new hires of student interns fell from 35,000 in 2010 to 4,000 in 2018.¹ When just 6.8% of full-time federal workers are under the age of 30—compared to almost 20% of the employed U.S. labor force in 2020—government is leaving talent on the table by failing to build a strong pipeline from internships to full-time employment. To tackle the challenge of an aging workforce and not enough young people joining and staying in government, agencies must make better use of internship programs.

There are several reasons why internships and clerkships are critical for recruiting talent. First, internships are a valuable way to evaluate talent on the job. There is no better way to judge someone’s skills, capabilities, and work ethic than by witnessing it firsthand through an internship experience. In Congress, internships are an accepted and valuable stepping stone toward a permanent position. High-performing companies also foster the next generation of talent through internships. Yet the federal government doesn’t widely utilize internships and many federal agencies are missing the opportunity to use internships as a pipeline to full-time employment.

To begin solving this problem, agencies must be more strategic about meeting students where they are and establishing relationships with colleges and universities. The Partnership runs *Call to Serve*, the only national network that brings federal agencies together with nearly a thousand institutions of higher learning to promote federal service and recruit the next generation of public servants. Our experience has shown that many agencies have not built and sustained strategic partnerships with diverse talent sources in communities or with colleges and universities, which is critical to building talent pipelines for their organization over time. In addition, many agencies have not aligned their recruitment cycle with the private sector and are often recruiting for talent late in the school year when students already have private sector offers in hand. This puts the public sector well-behind the private sector in competing for top talent.

Second, internships offer the opportunity for the federal government to sell itself in a competitive talent market. The federal government offers myriad opportunities for meaningful and interesting work, but not enough people know about those jobs and internships. The federal government, because of budget constraints, will always have a hard time competing with the private sector on

¹ “Analytical Perspectives, Budget of the United States Government, Fiscal Year 2020,” March 18, 2019, p.77. Retrieved from <https://www.govinfo.gov/content/pkg/BUDGET-2020-PER/pdf/BUDGET-2020-PER.pdf>.

pay, but agencies almost always have an advantage in offering employees a sense of mission. The Partnership's [Best Places to Work in the Federal Government](#)® rankings regularly show that the match between employee skills and agency mission is a key driver of employee engagement, second only to effective leadership. The federal government needs to do more to showcase the incredible array of professional opportunities it offers and to recognize the accomplishments and innovation of the current workforce. Without compelling and shared stories of success in government, federal agencies will struggle to become an employer of choice for the tech-savvy, STEM-minded, and other forward-looking talent that government needs to attract. The Partnership's annual [Service to America Medals](#) (Sammies) program helps address this lack of recognition by highlighting the unique accomplishments of those in our federal workforce.

Third, internships are a valuable means of recruiting for diverse talent and developing the next generation of federal employees. A commitment to diversity, equity and inclusion must be a cornerstone in the transformation of how the government recruits, hires, develops and retains talent. There are countless benefits to having a diverse workforce—it expands perspective, improves decision-making, and ultimately leads to better organizational performance—but by failing to utilize internships as a talent pipeline, agencies are missing the opportunity to bring top talent into the federal government. Internships, proactive recruiting on college campuses, partnerships with universities (particularly minority-serving institutions) and better use of expedited hiring authorities are proactive ways to bring young and diverse talent into government.

To attract talent at all levels, Congress and the administration should work together to create new and innovative pathways—and expand existing ones—for diverse, mission-critical talent to join public service through fellowships, talent exchanges and service corps. In 2019, the Partnership collaborated with Mastercard, Microsoft, Workday and a dozen federal agencies to establish the [Cybersecurity Talent Initiative](#), which aims to build the next generation of cyber leaders for our country. This innovative cross-sector opportunity enables recent graduates to spend two years working for and receiving training in the federal government in a cyber-related position. At the end of two years, they will have an opportunity to apply for a position with one of the corporate partners and, if hired, will be eligible to receive student loan assistance up to \$75,000 from their private sector employer. This program, along with other innovative talent models like the U.S. Digital Service, 18F, and Presidential Innovation Fellows, shows how government can rethink its recruitment and retention strategy for mission-critical occupations. The talent is out there, and government's mission remains more compelling than ever, but agencies are losing out because the federal hiring system isn't nimble enough to compete with the private sector.

The Subcommittee could build on its March 17, 2021 hearing by continuing its oversight and identifying ways to strengthen STEM intern programs across the federal government. Congress should also authorize agencies to convert interns who come to the agency through third-party internship programs and count work hours of unpaid interns performing qualified work before conversion. This proposal does not have a cost and does not increase government hiring; it simply helps agencies access a wider pool of talent to fill positions. Congress could also authorize a government-wide expedited hiring authority for students and recent graduates, which should serve as an incentive for agencies to make greater use of the Pathways programs. Additionally, we encourage agencies to ensure that internships are a key component of their workforce plans and that they are setting aside full-time equivalent (FTE) positions to hire interns and convert them to full-time employees.

Responses by Dr. Andrew Rosenberg

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON INVESTIGATIONS & OVERSIGHT

Brain Drain: Rebuilding the Federal Scientific Workforce Questions for the Record to:
Andrew Rosenberg, PhD Director of the Center for Science and Democracy Union of Concerned Scientists

Submitted by: Representative Ed Perlmutter (CO-07)

In recent years, we have seen a rise in scientific integrity violations at federal agencies. Even when agencies have strong scientific integrity policies in place, political appointees have been willing to brush them aside when science contradicts their ideologies. Just yesterday, my office received a notice of a scientific integrity loss at a USGS water quality lab in my district.

1. How do scientific integrity violations contribute to brain drain, and why would a scientific integrity statute be important to recruiting and retaining scientists in federal agencies?

Response:

Strong scientific integrity policies are essential to the important work that federal scientists do every day. When science is at the forefront of decision-making at government agencies and agencies fully embody these policies, scientists are confident that they will be able to follow the science wherever it takes them. Federal scientists work for the public and they need to be able to conduct research on behalf of the public free of any sort of political interference.

When scientific integrity violations happen at federal agencies, it undermines the science that is needed to solve some of our most pressing issues and creates an environment where federal scientists are not able to freely conduct their research. This decreases morale among federal scientists, as we saw in our federal scientists' survey^[1] during the Trump administration, and ultimately results in career scientists leaving the federal workforce and prospective scientists choosing to look elsewhere for employment.

While scientific integrity violations can contribute to the *brain drain* of the federal government, the good news is that a strong scientific integrity statute could help to recruit and retain the scientists that many of our federal agencies desperately need. Having a strong scientific integrity statute in place would ensure protections from suppression and political interference for federal scientists and that the protections will be there for future administrations. The memorandum that was issued by the Biden administration on *Restoring Trust at Government Agencies Through Scientific Integrity and Evidence-based Policymaking*—is an important step forward, but there is more that Congress can and should do to protect federal scientists. Codifying a strong and robust scientific integrity policy into law would help restore independent science to its rightful place at the heart of government decision-making.

^[1] Carter, J. 2018. The good, the bad, and the ugly: The results of our 2018 Federal Scientists Survey. The Equation. Cambridge, MA: Union of Concerned Scientists. Blog, August 14. <https://blog.ucsusa.org/jacob-carter/the-good-the-bad-and-the-ugly-theresults-of-our-2018-federal-scientists-survey>.

Appendix II

ADDITIONAL MATERIAL FOR THE RECORD

REPORT SUBMITTED BY REPRESENTATIVE BILL FOSTER

Scientific Brain Drain:
Quantifying the Decline of the Federal Scientific Workforce

A Majority Staff Report
Prepared for Members of the Committee on Science, Space & Technology

March 2021

Summary of Findings

The Majority staff of the Committee on Science, Space, and Technology analyzed workforce data for seven science agencies within the Committee's jurisdiction: NSF, NASA, DHS S&T, NIST, NOAA, DOE and EPA. Among the staff's key findings are the following:¹

Environmental Protection Agency (EPA)

- EPA's workforce declined by 3.9% during the Trump Administration (Fiscal Year 2016-2020) and 16.6% from Fiscal Year (FY) 2009-2020;
- EPA's STEM workforce also declined by 3.9% during the Trump Administration. STEM losses accounted for roughly 60% of EPA's total Trump-era workforce decline;
- EPA STEM employment cuts during the Trump Administration were concentrated among environmental protection specialists (24.3% decrease) and environmental engineers (5.7% decrease), two vital STEM occupations;
- EPA's Office of Research and Development experienced a 7.6% workforce decline during the Trump Administration and a 17.2% decline between FY 2012-2019, losing nearly one-fifth of the office's total workforce in just seven years.

Department of Energy (DOE)

- DOE's civil service workforce declined by 3.1% during the Trump Administration and 7.2% from FY 2009-2020;
- DOE's civil service STEM workforce was flat during the Trump Administration. DOE lost 37 engineers during those years, including 32 nuclear engineers (13.2% decrease);
- Within DOE, the Offices of Energy Efficiency and Renewable Energy (8.7% decline), Fossil Energy (12.1% decline), and Nuclear Energy (21.2% decline) suffered deep civil service workforce losses during the first three years of the Trump Administration.

National Oceanic and Atmospheric Administration (NOAA)

- NOAA's workforce declined by 8.6% from FY 2009-2020;
- The NOAA STEM workforce declined by 1.6% during the same period;
- NOAA's STEM workforce experienced large declines in several critical scientific occupations during the Trump Administration, including fish biologists (8.1% decline), oceanographers (9.0% decline), and wildlife biologists (30.4% decline).

The combined civil service workforces of EPA, DOE and NOAA declined by 4,874 employees between FY 2009 and FY 2020.

¹ See the Methodology section for a description of data parameters and definitions.

Diversity in STEM

- Racial and ethnic employment gaps persist within most of the observed agency STEM workforces relative to their total workforces. Gender employment gaps are more pronounced within the STEM workforce specifically;
- Gender employment gaps are particularly glaring within the engineering workforce. At the end of FY 2020:
 - NOAA employed roughly 8.5 male engineers for every 1 female engineer;
 - DOE employed more than 4 male engineers for every 1 female engineer; and
 - EPA's engineering employment gap was responsible for more than half of the gender gap in the agency's entire STEM workforce;
- The Black / African American STEM workforce has seen little of the broader employment gains among historically underrepresented groups at several agencies:
 - NOAA's Black / African American STEM workforce only increased by 0.4% from FY 2016-2020 amidst a 13.6% increase in STEM employment among minority groups;
 - EPA's Black / African American STEM workforce experienced a 8.7% decline from FY 2016-2020 even as agency STEM employment among minority groups increased by a small amount.

These statistics are not dry facts. They represent research funded more slowly, laws and regulations less effectively enforced, morale weakened, perspectives narrowed, and opportunities missed to cultivate and support the next generation of great American scientists. They suggest a dangerous retrenchment of American scientific leadership.

Introduction and Discussion

Science is central to the ability of the United States to meet the great challenges of our time. Combating climate change, securing the nation against physical and cyber threats, transitioning to cleaner energy and transportation, protecting public health: science is an indispensable tool for the Federal Government as it navigates the crises and opportunities of the 21st century. But while the role of science in federal policymaking looms larger than ever, the scientific workforce charged with fulfilling that role is dangerously diminished.

The past decade has witnessed employment declines at critical federal science agencies. The declines, which extend back at least as far as the budget cuts of the early 2010's, were aggravated by the Trump Administration's open hostility towards federal scientists and the federal workforce in general. Several leading science agencies are smaller than a decade ago, with science, technology, engineering and mathematics (STEM) workforces that have declined or remained stagnant, and persistent gender and racial disparities in those workforces.² These trends threaten to weaken the ability of the federal scientific workforce to carry out the missions of their agencies.

The four years of the Trump Administration were devastating for the federal scientific workforce. Throughout many of the Federal Government's civilian scientific agencies, career scientists experienced political interference, bureaucratic obstruction, and personal retaliation. A few high-profile incidents that contributed to an impaired work environment include:

- Soon after President Trump took office in January 2017, agencies across the Federal Government removed climate research from their websites with little explanation;ⁱ
- For more than two years beginning in the summer of 2018, DOE blocked the release of the Interconnections Seam Study because it argued that greater connectivity between the eastern and western halves of the U.S. power grid would increase the country's use of renewable energy while reducing energy costs;ⁱⁱ
- At the end of 2018, EPA suppressed a draft toxicity assessment of the chemical formaldehyde that was expected to link formaldehyde exposure to leukemia.ⁱⁱⁱ The assessment remains suspended to this day;
- In September 2019, political leaders at the White House and Department of Commerce successfully pressured NOAA to publicly rebuke its own meteorological forecasters for presenting accurate scientific information that contradicted President Trump's erroneous description of the projected path of Hurricane Dorian across the southeast;^{iv}
- In September 2020, the White House ordered all federal agencies to cancel race-related diversity training sessions, an order that was quickly implemented by science agencies such as NOAA and EPA.^v

This type of political bullying compromised scientific integrity and caused morale among career scientists to plummet. A 2018 survey of federal scientists found that political interference, censorship and a fear of retaliation had weakened the morale of scientists in a number of critical

² U.S. Office of Personnel Management, "FedScope: Data Definitions," accessed here: <https://www.fedscope.opm.gov/datadefn/#stemocc>.

agencies.^{vi} The political marginalization of science was most apparent in episodes where upholding scientific integrity brought federal scientists into conflict with the Administration's political objectives. Science agency staff who were directed to pursue deregulatory actions not supported by evidence and suppress the threat of climate change found themselves at the center of the fiercest scientific clashes of the Trump era. Many career employees at science agencies left government service in frustration. One recent analysis found that more than 1,000 scientists departed just three agencies during the Trump Administration.^{vii}

While the Federal Government's scientific responsibilities are increasing, federal employment data reviewed by Committee staff reveal that the workforces of scientific agencies such as EPA, DOE, and NOAA declined or stagnated during the Trump Administration. This was true in terms of the overall civil service workforces and their STEM workforces specifically.

In addition, the presence of Presidential Management Fellows within science agencies declined precipitously over the last four years. The PMF program offers two-year fellowships to individuals who have earned an advanced degree within the last two years and have demonstrated exceptional leadership skills and academic achievements. While the absolute numbers of PMFs are small in the scheme of overall agency workforces, their impact on sustaining U.S. leadership in science fields is outsized. PMFs also represent an important workforce pipeline for young entrants to STEM positions in the civil service, as a significant percentage of PMFs traditionally convert to a permanent appointment or competitive service job in government at the end of their fellowships.

Presidential Management Fellows at Science Agencies

Science Agencies	FY 16	FY 17	FY 18	FY 19	FY 20
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	4	5	3	3	4
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY	0	0	0	2	3
DEPARTMENT OF ENERGY	23	23	9	2	2
ENVIRONMENTAL PROTECTION AGENCY	32	38	14	2	7
DEPARTMENT OF HOMELAND SECURITY	54	53	42	30	24
NATIONAL SCIENCE FOUNDATION	3	3	2	1	1
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	6	3	0	3	3
DEPARTMENT OF TRANSPORTATION	14	7	7	9	5
SCIENCE AGENCIES TOTAL	136	132	77	52	49

However, the diminishment of the federal scientific workforce did not begin with the Trump era. The imposition of sequestration in FY 2013 forced sweeping cuts to non-mandatory federal spending, and civilian scientific programs were fully exposed to the harmful budgetary consequences.^{viii} Subsequent austerity-minded federal budgets provided by Congress failed to restore the necessary funding for scientific activities and retained tight budgetary caps well into the middle of the decade. As a result, non-defense discretionary spending was lower in every year between FY 2013 and FY 2016 than it had been in FY 2012, the last year before

sequestration took effect, and the workforces of many science-based agencies declined during those years.^{ix}

Thus the 2010s witnessed a series of blows to the federal scientific workforce. In the middle of the decade, scientific agencies were starved of budgetary resources. Their workforces, already depleted by budget cuts, faced a political assault on their core scientific missions during the Trump era. The Trump Administration's threats against federal science exacerbated the challenges experienced by the STEM workforce, but it did not create them out of thin air. The reduced scientific workforce of today is the culmination of a decade-long trend.

A smaller scientific workforce undermines the ability of science agencies to fulfill their missions: research slows, work backlogs lengthen, grants take longer to award, regulation and enforcement suffer, and the remaining STEM employees must assume a larger burden to compensate. The loss of talented and experienced federal employees - scientists and non-scientists alike - threatens to deprive the Federal Government of vital institutional knowledge and expertise that took decades to develop and could require years to recover. The attacks on science over the past four years could have serious and lasting consequences for federal scientific capacity in the years ahead. Meanwhile, non-U.S. competitors are redoubling their own investments in research and development and have a pipeline of STEM talent to support them.

The damage done to our federal STEM workforce is real, but it is not irreversible. Restoring scientific integrity, increasing funding for science agencies, embracing proactive recruitment, hiring and retention policies, and deepening the Federal Government's commitment to diversity and equity in the workforce would bolster federal scientists and rebuild the workforce. Reversing the damage and restoring the scientific workforce - and the role of science in federal policymaking - will require sustained and long-term attention, support, and funding from both Congress and the executive branch.

Methodology

This report utilizes federal employment data to illustrate the size and nature of the reductions in the federal scientific workforce that have occurred over the past decade. Except where otherwise noted, the analysis is concerned with civil service employees.

There is no formal definition of the federal “scientific workforce” and no single comprehensive data source detailing federal scientific employment. This report’s workforce data parameters are designed to support two objectives: a broad assessment of the total workforces of science agencies and offices; and a targeted evaluation of critical scientific occupations within those agencies. The parameters are further shaped by the Committee’s jurisdiction and priorities. Under House Rule X, the Committee possesses oversight jurisdiction over “laws, programs, and Government activities relating to nonmilitary research and development.”⁸ The seven agencies assessed by this report fall squarely within the Committee’s jurisdiction. Additionally, promoting STEM education, strengthening the Federal Government’s STEM capabilities, and enabling gender and racial equality in STEM fields are longstanding priorities for the Committee.

For each science agency listed above, Committee staff analyzed four categories of data:

- Overall agency employment
- Agency STEM employment
- Gender employment
- Racial and ethnic employment

Staff used data from three primary sources: the U.S. Office of Personnel Management (OPM) FedScope database; selected budget appendix tables from the Office of Management and Budget (OMB); and selected Congressional budget justifications. All employment data is expressed through full-time equivalent employment, or FTEs, a standard workforce metric that quantifies employment by the number of regular straight time-hours worked (excluding overtime and holiday hours) in relation to the number of compensable hours in a fiscal year. One FTE is considered one work year. This report refers to FTE data interchangeably with federal employment levels.

FedScope data was refined to include only non-seasonal, full-time permanent employees; part-time and seasonal employees were excluded from the data set. FedScope data is organized by fiscal year and refers to the number of employees in pay status on the last day of the fiscal year. FedScope data was analyzed for all fiscal years between 2009 and 2020. For the purposes of this report, employment data for the Obama Administration refers to FY 2009-2016, or the period from September 30, 2009 through September 30, 2016. Employment data for the Trump Administration refers to FY 2016-2020, or the period from September 30, 2016 through September 30, 2020.

FedScope provided data for agency employment, agency STEM employment, gender employment and racial and ethnic employment. However, FedScope does not contain data breakouts for all of the accounts within the Committee’s jurisdiction at DOE and EPA. In those instances, the data analysis was supplemented by budget appendix tables and Congressional

budget justifications detailing employment levels for selected offices such as DOE's Office of Energy Efficiency and Renewable Energy (EERE), DOE's Office of Fossil Energy (FE), DOE's Office of Nuclear Energy (NE), and EPA's Office of Research and Development (ORD). Budget appendix tables were identified for fiscal years 2009-2019, while Congressional budget justifications pertaining to EPA ORD were identified for fiscal years 2012-2019. Workforce analyses for those offices were limited to those years.

For the discussion on DOE contracting staff, Committee staff examined data collected from DOE by the Congressional Research Service and self-reported numbers from the prime contractors supporting DOE site offices and national laboratories. The Office of Personnel Management aggregated data from agencies on Presidential Management Fellows.

Each section of this report presents employment data for all seven agencies reviewed by Committee staff. Further data analysis focuses upon three agencies in particular: EPA, DOE and NOAA.

Committee staff thanks the Partnership for Public Service, the Congressional Research Service, DOE Congressional and Intergovernmental Affairs, the Office of Personnel Management, and Wendy Ginsberg and Cassie Winters of the Committee on Oversight and Reform staff for providing information that helped inform the development of this report.

Overall Agency Employment

No single narrative neatly captures the diverse range of employment trends at the seven science agencies reviewed in this report. Despite cross-cutting budgetary and political pressures, a few scientific agencies managed to maintain or enlarge their workforces. Other scientific agencies saw devastating employment cuts.

NSF, DHS S&T and NIST enjoyed significant workforce increases over the past decade, although the rate of growth slowed for NIST and reversed entirely for DHS S&T during the Trump Administration. NASA's workforce remained largely flat over the decade and during the Trump Administration, experiencing small increases and ending the decade less than 1% larger than at the onset.

On the other hand, EPA, DOE and NOAA saw dramatic employment declines over the decade. NOAA curtailed its workforce decline somewhat during the Trump era. The EPA and DOE workforces continued to shrink even further during the Trump era.

Total Agency Employment, FY 2009-2016-2020 (FTEs)

	FY 2009	FY 2016	FY 2020	% Change (2016-2020)	% Change (2009-2020)
NSF	1,180	1,208	1,283	+ 6.2%	+ 8.7%
NASA	16,970	16,985	17,099	+ 0.7%	+ 0.8%
DHS S&T	359	442	421	- 4.8%	+ 17.3%
NIST	2,605	2,919	2,980	+ 2.1%	+ 14.4%
EPA	16,456	14,287	13,732	- 3.9%	- 16.6%
DOE	15,134	14,499	14,047	- 3.1%	- 7.2%
NOAA	12,323	11,148	11,260	+ 1.0%	- 8.6%

EPA Total Employment

EPA has suffered nearly a decade of workforce cuts, and the agency is substantially diminished as a result. The 16.6% decline between FY 2009-2020 does not fully depict the extent of the Agency's retrenchment. Since reaching its recent employment peak of 16,702 FTEs in FY 2011, EPA has lost 2,970 employees, a 17.8% (one-sixth) decrease in less than a decade. The most far-reaching employment losses occurred during the second half of the Obama Administration, as sequestration and restrictive budgetary caps forced deep budget cuts at EPA and slashed the agency's workforce sharply, resulting in a 13.2% employment decrease between FY 2009-2016. But the agency's workforce decline continued through the Trump Administration with an additional 3.9% decrease from FY 2016-2020. For an agency with complex and high-profile regulatory, enforcement, research and educational responsibilities, a 16.6% workforce decline over the course of a single decade is disastrous.

EPA Office of Research and Development Total Employment and Budgets, FY 2012-2016-2019 (FTEs)

	FY 2012	FY 2016	FY 2019	% Change (2016-2019)	% Change (2012-2019)
EPA ORD FTEs	1,903	1,704	1,575	- 7.6%	- 17.2%
EPA Enacted Appropriations: Science & Technology	\$901 million	\$784 million	\$708 million	- 9.7%	- 21.4%
EPA Actual Budget Authority: Research & Development	\$627 million	\$516 million	\$479 million (estimated)	- 7.2%	- 23.6%

ORD is the scientific research arm of EPA. It oversees ORD laboratories and manages the agency's regional laboratories, manages grant programs for environmental research, develops gold standard chemical toxicity assessments, and conducts scientific research that underpins regulatory policymaking by agency program offices.^{xi} ORD is a key pillar of EPA's mandate to use the best available science to protect public health and the environment. Between FY 2012-2019, however, ORD's workforce declined sharply. The office employed 328 fewer employees at the end of FY 2019 than seven years earlier, a 17.2% decline. During the first three years of the Trump Administration, ORD's workforce declined by 7.6%.

The leading cause of ORD's workforce reductions since FY 2012 are the cuts to EPA's science budget that have occurred over the same period. Actual budget authority for R&D programs fell 23.6% in real dollars from FY 2012-2019. Adjusted for an average inflation rate of 1.55 per year, the decrease is over 30%. EPA's S&T account saw a very slight increase since FY 2019, with an enacted appropriations amount set at \$716 million for FY 2021.

ORD provides an indispensable service to the agency and the entire country as a premier source of landmark environmental research. The office is a global leader in pushing the frontiers of environmental knowledge forward, and it has a vital role to play in EPA's ongoing mission to strengthen environmental protections, combat climate change, and promote environmental justice for vulnerable communities. But the sustained employment cuts of the 2010's place a punishing burden on ORD's remaining workforce.

DOE Total Employment

DOE's sprawling portfolio extends from managing the country's nuclear arsenal to promoting a range of energy sources to overseeing the National Laboratory system. Unfortunately, DOE similarly underwent a decade of reductions to its civil service employees. The DOE workforce, bolstered by a surge of funding under the American Recovery and Reinvestment Act of 2009 (ARRA), reached its recent peak in FY 2010 at 15,757 FTEs. Since then, DOE has lost 1,710 employees. Once again, the largest annual declines followed the budget cuts of the early 2010's, and DOE's workforce decreased by 4.2% between FY 2009-2016. But steep employment cuts continued at a similar pace during the Trump Administration, and the agency workforce declined

by an additional 3.1% between FY 2016-2020, even while Departmental budgets increased substantially. DOE's civil service workforce decline is undermining its ability to fulfill Congressional objectives for advancing clean energy technologies.

Department of Energy Enacted Budgets (in millions)

Year	Department of Energy	Energy Efficiency & Renewable Energy	Fossil Energy	Nuclear Energy
FY09	33,856	2,157	1,097	1,357
ARRA	36,725	16,800	3,400	--
FY10	26,426	2,216	939	858
FY11	25,693	1,772	573	806
FY12	26,320	1,781	854	555
FY13	25,137	1,692	699	798
FY14	27,225	1,901	779	888
FY15	27,402	1,841	791	822
FY16	29,603	2,073	632	986
FY17	30,087	2,090	668	1,017
FY18	34,518	2,322	727	1,205
FY19	33,534	2,379	740	1,326
FY20	38,600	2,848	750	1,493
FY21	38,657	2,864	750	1,508

DOE Program Office Employment, FY 2009-2019 (FTEs)

Year	Department of Energy	Energy Efficiency & Renewable Energy	Fossil Energy	Nuclear Energy
FY09	15,143	536	602	366
FY10	15,757	815	628	350
FY11	15,548	741	621	367
FY12	15,041	723	570	404
FY13	14,739	729	581	386
FY14	14,341	680	579	387
FY15	14,443	615	582	378
FY16	14,499	634	569	359
FY17	14,249	675	553	339
FY18	13,809	604	517	304
FY19	13,774	579	500	283
FY20	14,047	not available	not available	not available
% Change (FY16-19)	-3.1%	-8.7%	-12.1%	-21.2%
% Change (FY09-19)	-7.2%	+8.0%	-16.9%	-22.7%

DOE's employment losses manifested within the agency's applied energy programs. Three program offices vital to DOE's clean energy mission are EERE, FE and NE. EERE promotes the country's transition to a clean energy economy through research and development initiatives that support domestic clean energy manufacturing, assist the growth and integration of renewable energy sources within the electricity grid, and energy efficiency and sustainability for the Federal Government and the private sector.^{xiii} FE oversees research programs to significantly reduce environmental impacts of the country's development and use of domestic fossil fuel resources. NE manages research and development programs to bolster the country's domestic nuclear energy sector, including the funding of advanced nuclear reactor projects and the development of advanced nuclear fuel cycles.^{xiii}

All three program offices are critical components of America's effort to remain a global leader in energy development. But all three experienced severe workforce declines in recent years. EERE benefited from funding increases in the early years of the Obama Administration and increased its workforce significantly between FY 2009-2016, but the Trump Administration oversaw a reversal in employment that cut EERE's workforce by 8.7% during its first three years in office. After reaching peak employment in FY 2010 at 815 FTEs, EERE's workforce lost 236 employees and decreased by 28.9% over the next nine years. Indeed, EERE employed only 43 more staffers in FY 2019 than it did a decade earlier, despite the global boom in clean energy deployment and steadily-increasing appropriations from Congress.

The FE and NE workforces saw even greater declines than EERE. FE's workforce decreased somewhat during the Obama Administration, but the trend accelerated during the Trump Administration with large annual employment cuts that produced a 12.1% decline from FY 2016-2019 and a 16.9% decline from the start of the decade. NE's workforce witnessed an even more dramatic turnaround: after eight years of stability and mostly minor fluctuations during the Obama Administration, NE's employment precipitously dropped during each of the first three years of the Trump Administration. NE lost 76 employees over those three years from FY 2016-2019, a 21.2% workforce decline with no parallel earlier in the decade. At the end of FY 2019, NE's workforce was 22.7% smaller than ten years prior, a decline of more than one-fifth of its overall size. Both of these offices support programs that are critical innovation engines to address the global climate crisis while ensuring low-cost and reliable electricity for Americans. It is remarkable that FE, NE and EERE civil service staffs have been depleted so substantially when all three programs have demonstrated their utility as job creators and enjoy substantial bipartisan support in Congress.

However, DOE is an outlier among federal agencies in that the vast majority of the staff supporting its mission are contractors and not civil servants. In FY2019, when DOE had 13,774 civil servants on staff, DOE and the Federal Energy Regulatory Commission (FERC) together had 102,348 contractor employees.³ These contractors work hand-in-hand with civil servants across all of the Department's program offices. The national laboratories and other DOE site offices are almost entirely staffed by contractors, with the exception of the National Energy Technology Laboratory (NETL). DOE headquarters also hosts a substantial number of

³ As with the civil servant statistics for DOE employees, the contractor data reported by DOE in their annual Agency Financial Reports include data for FERC, which is administratively situated within DOE. FERC's share of these figures is relatively small as it listed only 165.2 contractors in the FY19 Service Contract Inventory.

contractees. A large segment of DOE contract employees perform both STEM and non-STEM functions for environmental remediation at legacy Cold War sites and other nuclear weapons-related activities. The figures below reflect the full breadth of DOE contractors under large Management & Operations (M&O) and other types of contracts. At the end of FY19, 50,144 of the 102,348 DOE contractors were working under the National Nuclear Security Administration (NNSA).

Table 3. Department of Energy Contractor Employees

Fiscal Year	Contractor Personnel
2009	91,294
2010	99,370
2011	100,072
2012	92,419
2013	100,294
2014	94,302
2015	93,485
2016	96,286
2017	97,981
2018	99,222
2019	102,348

Source: DOE, *Agency Financial Report Fiscal Year 2019*; DOE, *Fiscal Year 2016 Agency Financial Report*; DOE, *Fiscal Year 2013 Agency Financial Report*.

Notes: Contractor personnel numbers are reported for the entire department and include data from FERC. Data reported by DOE as FTEs as of the end of the fiscal year.

As the DOE civil service workforce declined by 7.2% / 1,100 employees from FY09-19, its contractor workforce increased by about 11,000. An apples-to-apples breakdown of DOE contracting staff across program offices was not available, but data provided by DOE for specific sites noted:

- The National Renewable Energy Laboratory (NREL) receives 95% of its funding from EERE. It grew by 1,067 contractors from 2009 to 2020, a 75% increase;
- The functions of Idaho National Laboratory managed by Battelle Energy Alliance are the primary engine of DOE research for the Office of Nuclear Energy and accounts for roughly half of the DOE NE budget as of FY20. Battelle contractors at INL increased by 696 from 2009 to 2020, a 65% increase;
- Ames National Laboratory, which received about \$20 million from the DOE Office of Science and \$26 million from EERE in FY2020, grew from 188 employees in 2009 to 427 in 2020, a 227% increase.

NOAA Total Workforce

NOAA also experienced sizable workforce reductions over the decade. NOAA's workforce was stable from FY 2009-2011, reaching a peak in FY 2011 at 12,371 FTEs. Since FY 2011, however, NOAA's workforce fell by 1,111 employees, a 9.0% decrease over nine years. The decline was concentrated from FY 2012-2016, and after FY 2016 NOAA did manage to increase its workforce by 1.0%. But this addition of 112 employees, while welcome, only restored about one-tenth of the over 1,000 employees lost during the preceding years.

NOAA's leadership in federal climate research and its role in helping to protect Americans from the growing incidence of extreme weather events will increasingly position the agency at the center of the Federal Government's scientific activities. But an 9.0% workforce decline threatens to impact NOAA's scientific capacity and hinder its scientific mission.

Agency STEM Employment

NSF, NASA, NIST and even DOE experienced significant increases in STEM employment over the past decade. However, the decade-long trends for these agencies mask a noticeable slowdown in STEM employment growth during the Trump era. At all four agencies, STEM employment growth slowed during the Trump Administration. STEM employment patterns over a given period, regardless of the size of an agency's STEM workforce, should always be determined based upon agency workforce requirements.

STEM employment growth at DOE halted entirely, and the DOE STEM workforce was exactly the same size at the end of FY 2020 as at the end of FY 2016. NOAA's STEM workforce increased slightly during the Trump Administration, but not enough to recover completely from employment cuts earlier in the decade. NOAA's STEM workforce was smaller at the end of FY 2020 than a decade prior. EPA's STEM workforce declined substantially during the Trump Administration, and DHS S&T saw a sizable STEM employment decline during the same period, reversing the employment growth of the Obama era.

Agency STEM Employment, FY 2009-2016-2020 (FTEs)

	FY 2009	FY 2016	FY 2020	% Change (2016-2020)	% Change (2009-2020)
NSF	355	423	492	+ 16.3%	+ 38.6%
NASA	10,479	11,133	11,548	+ 3.7%	+ 10.2%
DHS S&T	181	194	166	- 14.4%	- 8.3%
NIST	1,378	1,696	1,802	+ 6.3%	+ 30.8%
EPA ⁴	**	8,632	8,294	- 3.9%	**
DOE	4,703	4,993	4,993	0.0 %	+ 6.2%
NOAA	7,191	6,939	7,076	+ 2.0%	- 1.6%

EPA STEM Employment

EPA's STEM workforce declines manifested throughout the different STEM occupational series. Employment in science, technology, engineering and mathematics occupations at the agency decreased by 338 employees between FY 2016-2020, a 3.9% decline in the overall STEM workforce. Roughly 60% of EPA's overall employment decrease during the Trump Administration was concentrated among STEM employees. The fact that more than half of the agency's total workforce decline occurred among career scientists indicates the extent of the damage that EPA's scientific workforce experienced over the past four years, and the scientific capacity that must be restored as rapidly as possible.

A detailed review of each STEM occupational series further reveals the pernicious impact of STEM workforce losses upon scientific professions that are essential to the agency's mission.

⁴ Due to an apparent reclassification of certain STEM occupations during the Obama Administration, it is difficult to utilize STEM workforce data to reliably compare EPA STEM employment over the course of the entire decade. Therefore, this report will only assess STEM workforce data between the years FY 2016 and FY 2020, for which the data can be consistently applied.

The sweeping scope of career federal scientist departures over the past four years could undermine EPA's broader capabilities due to the centrality of the scientific workforce to many core agency functions.

EPA STEM Employment by Function (Full Time Employees at end of Fiscal Year)

	FY 2016	FY 2020	% Change (2016-2020)
Science	6,178	5,922	- 4.1%
Technology	600	627	+ 4.5%
Engineering	1,789	1,695	- 5.3%
Mathematics	65	50	- 23.1%

The EPA science workforce, which refers specifically to science occupational series, declined by 4.1% (256 scientists) during the Trump Administration. The impact of the decline was not evenly distributed. Most notably, the number of environmental protection specialists employed by EPA plummeted from 2,152 to 1,630, a 24.3% decline. The loss of nearly one-quarter of the agency's environmental protection specialists, 522 in all, represents a blow to the heart of the EPA workforce and a loss of institutional knowledge and expertise that must be rebuilt to revitalize a core agency function. While no other science occupation saw a comparable decrease in real terms, other types of agency scientists did experience high relative decreases. Between FY 2016-2020, EPA hydrologists declined by 33.3%, microbiologists declined by 22.2%, geologists declined by 17.5%, ecologists declined by 12.2%, chemists declined by 10.5%, and toxicologists declined by 8.2%.

The EPA engineering workforce, while smaller than the science workforce, actually underwent a larger relative decline. The agency lost 94 engineers over the course of the Trump Administration, a 5.3% decline. Engineering employment cuts were largely concentrated in three engineering occupations: environmental engineering, which constitutes 85% of the agency engineering workforce, mechanical engineering and chemical engineering. Environmental engineering lost 88 staffers (5.7%) from FY 2016-2020. Other types of engineers suffered even larger relative declines, with mechanical engineers decreasing by 15.4% and chemical engineers decreasing by 11.5% over the same period of time.

DOE STEM Employment

DOE's STEM workforce avoided the large-scale personnel cuts that characterized broader employment at the agency during the Trump Administration and over the past decade. However, recent trends in STEM employment at DOE are not encouraging, particularly in certain segments of the engineering workforce. STEM workforce employment increased during the Obama Administration and peaked at 4,993 FTEs at the end of FY 2016. STEM employment then declined under President Trump to 4,850 FTEs by the end of FY 2019. The trend reversed again in a positive direction in FY 2020, and STEM employment recovered its previous losses to end the last fiscal year of the Trump era at 4,993 FTEs, exactly the same size as four years earlier. Given the increasingly prominent DOE role in the rapid transformation of the global energy sector, allowing STEM employment to remain flat over four years seems like a missed

opportunity. The size of civil service at DOE does not seem proportional to the critical responsibilities that DOE must assume in the years ahead. The Trump Administration's failure to build upon the gains achieved earlier in the decade enhances the need to make up for lost time and strengthen DOE's scientific workforce capacity quickly.

A detailed review of DOE STEM occupational categories confirms the general lack of growth over the past four years, as well as particularly concerning trends in certain specific occupations that are central to DOE's agenda.

DOE STEM Employment by Function (Full Time Employees at end of Fiscal Year)

	FY 2016	FY 2020	% Change (2016-2020)
Science	1,432	1,438	+ 0.4%
Technology	635	674	+ 6.1%
Engineering	2,694	2,657	- 1.4%
Mathematics	232	224	- 3.4%

DOE's civil service science occupations remained essentially flat during the Trump Administration, with a 0.4% employment increase. Some scientific occupations experienced significant decreases. Parallel to their more numerous counterparts at EPA, the number of environmental protection specialists at DOE decreased by 7.1% between FY 2016-2020. Chemists - few to begin with in FY 2016, at only 37 FTEs – declined by 18.9%. The much larger number of scientists employed in general physical science declined by 1.2%. Meanwhile, the agency's mathematics workforce largely consisted of mathematicians employed in operations research, an occupation that constituted more than half of the entire math workforce throughout the Trump era. But operations research employment declined by 8.8% during the Trump Administration, accounting for more than the entire net reduction in the DOE mathematics workforce. As a result, despite gains in other math occupations, the DOE mathematics workforce experienced an aggregate decline of 3.4% between FY 2016-2020.

DOE's engineering workforce, the largest of the agency's four STEM occupational categories, declined by 37 engineers, or 1.4% during the Trump Administration. Specific engineering occupational series experienced deeper declines from FY 2016-2020:

- 4.8% decline among general engineers
- 20.0% decline among environmental engineers
- 32.0% decline among chemical engineers
- 45.8% decline among safety engineers.

Perhaps most notably, given DOE's responsibilities for maintaining America's nuclear arsenal and promoting research into advanced nuclear technologies, DOE lost 32 nuclear engineers during the Trump Administration, a loss of 13.2%.

NOAA STEM Employment

NOAA's STEM workforce experienced a 1.6% decline over the past decade, with 115 fewer STEM employees at the end of FY 2020 than at the end of FY 2009. The decline occurred between FY 2012-2016, as strict budgetary caps placed downward pressure on the entire NOAA workforce. The Trump era witnessed a partial recovery, with the STEM workforce increasing by 2.0% between FY 2016-2020 and surpassing 7,000 employees once again after falling to 6,939 at the end of FY 2016. However, STEM workforce gains over the past four years were only able to restore slightly more than half of the losses from the earlier part of the decade. As one of the Federal Government's premier climate research agencies, the fact that NOAA's STEM workforce was smaller at the end of the decade than it was at the beginning is alarming.

Within NOAA's STEM occupational categories, an ambiguous picture emerges from recent years: limited but insufficient workforce recovery, further offset by damaging employment cuts among critical scientific employees. The data indicates that while more recent trends have been positive, a great deal of work lies ahead to fully restore NOAA's scientific capacity.

NOAA STEM Employment by Function (Full Time Employees at end of Fiscal Year)

	FY 2016	FY 2020	% Change (FY16-FY20)
Science	5,538	5,707	+ 3.1%
Technology	1,043	999	- 4.2%
Engineering	247	257	+ 4.0%
Mathematics	111	113	+ 1.8%

NOAA's science occupations increased by a fair amount during the Trump Administration, gaining 169 scientists, or 3.1%. However, these gains were barely enough to undo earlier employment losses. The science occupations only increased by 1.0% over the course of the entire decade. Moreover, certain segments of the science workforce experienced employment decreases during the Trump era that diverged from the larger trend, particularly oceanic and biological scientists:

- NOAA lost 69 fish biologists, a decrease of 8.1%, from FY 2016-2020.
- NOAA's oceanography workforce fell by 9.0%.
- NOAA's wildlife biology workforce, while small in real terms, plummeted 30.4%.
- Chemists declined by 12.3%.
- Physicists declined by 11.4%.

Given NOAA's role in understanding the state of the world's oceans and marine life and developing forecasts critical to protecting life and property from more frequent and intense weather events due to climate change, the departure of many scientific experts in these fields during the Trump Administration strike at the heart of one of NOAA's core scientific missions.

Other STEM occupational categories did not demonstrate the same dramatic internal divergences as the science workforce, but they nevertheless affirm that NOAA's STEM workforce has struggled to recover to earlier employment levels. The engineering workforce, despite increasing by 4.0% since FY 2016, has declined overall by 5.9% since FY 2009. The technology workforce, which mostly consists of information technology experts, declined by 4.2% during the Trump

Administration and 14.6% over the course of the entire decade. Finally, the mathematics workforce only gained two additional mathematicians during the Trump era, a slowdown in its rate of growth from earlier in the decade. Overall, the NOAA STEM workforce's small increase over the past four years did not overcome the broader declines of the early-mid 2010's, suggesting that long-term investments will be necessary to sustain workforce growth and bolster NOAA's career scientists.

Agency STEM Diversity

For the Federal Government, achieving a diverse and inclusive federal STEM workforce is both a moral necessity and a practical imperative. An extensive body of research demonstrates that diversity within scientific groups enhances scientific innovation by fostering greater creativity through a wider range of perspectives.^{xiv} Diverse scientific teams, benefiting from their ability to elevate talented scientists from a broader cross-section of society and the complexity of insight that results, achieve better outcomes than homogenous teams.^{xv} Additionally, the increasing diversity of the U.S. population will make greater STEM participation across historically underrepresented groups, including women and communities of color, a central pillar of the Federal Government's ability to meet its rising demand for STEM employees in the decades to come.^{xvi} Finally, it is a fundamental moral responsibility for the Federal Government to advance the core American values of fairness and equality by embracing equal opportunity within the federal STEM workforce. For the sake of their own scientific capabilities, as a model for the nation, and as a driver of change, federal agencies with STEM activities must do more to embrace diversity within their ranks.

All seven agencies had gender, racial and ethnic disparities in their STEM workforces at the end of FY 2020. The size and nature of the disparities varied between agencies, but the overall pattern was clear: agency STEM workforces are less diverse than the agencies as a whole.

At NSF and EPA, majority female agency workforces failed to translate to STEM workforces, which are majority male. At NASA, DHS S&T and NIST, the gender employment gaps within STEM workforces – which all featured ratios of male to female employees above 3 to 1 – were substantially larger than the corresponding gaps within overall agency workforces. DOE and NOAA STEM workforces had nearly 3 men for every 1 woman, ratios that were also significantly higher than their total agency workforces.

Employment disparities among racial and ethnic minority groups exhibited similar patterns at most agencies.⁵ DHS S&T and DOE had the smallest employment gaps, with members of minority groups employed at nearly the same levels in their STEM workforces as in their overall workforces. NASA, NIST and EPA contained larger racial and ethnic employment gaps, as STEM workforces featured significantly lower ratios of minority employees to white employees than agency workforces as a whole. Racial and ethnic employment disparities were most significant at NSF and NOAA.

⁵ Racial and ethnic data for this report was derived from OPM's FedScope database and is subject to OPM's definitions of racial and ethnic identification. FedScope defines "Minority" employees as those federal employees identifying as: Hispanic or Latino; American Indian or Alaska Native; Asian; Black or African American; or Native Hawaiian or Other Pacific Islander. Additionally, FedScope's "Minority" employment data includes federal employees who identify as "more than one race."

Agency Gender Employment, FY 2020 (FTEs)

	Male Employment	Female Employment	Workforce Male : Female Ratio	STEM Male Employment	STEM Female Employment	STEM Male : Female Ratio
NSF	503	780	1 : 1.5	268	224	1.2 : 1
NASA	11,229	5,870	1.9 : 1	8,721	2,827	3.1 : 1
DHS S&T	262	159	1.6 : 1	130	36	3.6 : 1
NIST	1,904	1,076	1.8 : 1	1,375	427	3.2 : 1
EPA	6,591	7,141	1 : 1.1	4,445	3,849	1.2 : 1
DOE	8,967	5,080	1.8 : 1	3,693	1,300	2.8 : 1
NOAA	7,380	3,880	1.9 : 1	5,180	1,896	2.7 : 1

Agency Racial and Ethnic Employment, FY 2020 (FTEs)

	White Employment	Minority Employment	Workforce White : Minority Ratio	STEM White Employment	STEM Minority Employment	STEM White : Minority Ratio
NSF	700	579	1.2 : 1	351	138	2.5 : 1
NASA	12,095	4,994	2.4 : 1	8,657	2,885	3 : 1
DHS S&T	282	139	2 : 1	116	50	2.3 : 1
NIST	2,181	799	2.7 : 1	1,393	409	3.4 : 1
EPA	8,934	4,782	1.9 : 1	5,829	2,458	2.4 : 1
DOE	10,174	3,868	2.6 : 1	3,687	1,303	2.8 : 1
NOAA	8,959	2,301	3.9 : 1	6,084	992	6.1 : 1

EPA, DOE and NOAA STEM Diversity: Gender

Unlike the majority of federal agencies, EPA employed 550 more female than male career employees at the end of FY 2020. While the agency has been buffeted with massive employment cuts in recent years, female employment declined less severely than male employment during the Trump Administration and over the entire decade. EPA's STEM workforce, however, included 596 more male than female STEM employees at the end of FY 2020. A majority-male STEM workforce in a majority-female agency represents a clear gender gap. The disparity is especially pronounced in the engineering workforce. EPA employed 1,060 male engineers and 635 female engineers in FY 2020, a gender gap of 425 staffers that accounted for more than two-thirds of the gender employment gap in the entire STEM workforce. Recent trends have been encouraging, as the proportion of female STEM employees did increase from FY 2016-2020. But gender diversity must continue to be an agency STEM priority.

DOE's gender disparity grew over the past decade. The agency's total workforce employed 1.8 men for every 1 woman in FY 2020. DOE's female workforce declined by 3.8% during the

Trump Administration and 12.0% since FY 2009, whereas the agency's male workforce only declined by 2.8% and 4.2%, respectively, during the same periods. The DOE gender gap was even wider in STEM fields, although it did contract somewhat over the past four years. At the end of FY 2020, DOE employed 2.8 male STEM employees for every 1 female STEM employee, compared to 1.8 male employees for every 1 female employee in the entire agency. The STEM gender gap was again pronounced among engineering occupations, the largest segment of the DOE STEM workforce. Male engineers outnumbered female engineers at DOE by more than 4 to 1 in FY 2020.

NOAA's total workforce saw a similar gender disparity as DOE, but the workforce is trending in a more equitable direction. While the agency employed 1.9 men for every 1 woman at the end of FY 2020, the size of the employment gap declined significantly over the course of the decade. The status of the agency's STEM workforce, however, is less encouraging. NOAA's STEM workforce employed 2.7 men for every 1 woman in FY 2020, a wider gender gap than the agency at large. Astonishingly, in FY 2020, NOAA only employed 27 female engineers alongside 230 male engineers, a ratio of 8.5 to 1. NOAA's female STEM workforce did experience relative growth between FY 2016-2020.

EPA, DOE and NOAA STEM Diversity: Race and Ethnicity

Racial and ethnic minority groups saw troubling workforce trends at EPA in recent years. Overall agency employment among minority groups fell 9.2% between FY 2009-2020. The agency STEM workforce was left with a larger diversity gap than the overall workforce: in FY 2020, EPA employed 2.4 white STEM employees for every 1 STEM employee from a minority group, compared to just 1.9 white employees for every 1 employee from a minority group in the agency at large. The impact was particularly acute among Black / African American STEM employees, who declined by 8.7% (85 employees) during the Trump Administration and 22.4% over the course of the decade. Black / African American environmental protection specialists at EPA declined by 25.6% during the Trump Administration. Black / African American environmental engineers at EPA declined by 10.6% during the same period.

FY 2009-2020 saw a precipitous decline in the size of DOE's overall workforce, due in part to an increasing reliance on contractors. During this period, however, agency employment among minority groups defied the broader trend and increased slightly. Alongside overall agency employment, DOE's STEM workforce achieved a smaller employment gap than other scientific agencies. But recent employment trends demonstrate serious shortcomings as well. For example, DOE's Black / African American workforce underwent an enormous 10.4% decline over the course of the decade, including a 2.2% decline during the Trump Administration.

NOAA oversaw the largest racial and ethnic disparities, in terms of overall and STEM workforces, of the seven observed agencies. At the end of FY 2020, NOAA employed 3.9 white employees for every 1 employee from a minority group. In STEM fields, NOAA employed 6.1 white STEM employees for every 1 STEM employee from a minority group. Again, the disparity in NOAA's STEM workforce was most acute for Black / African American STEM staffers. During the Trump Administration, as STEM employment among minority groups increased by

13.7% and the size of the overall STEM workforce increased slightly, Black / African American STEM employment actually declined by a single employee.

ⁱ Scott Waldman, "Climate webpages erased, obscured under Trump – report," *E&E News*, January 10, 2018, accessed here: <https://www.eenews.net/climatewire/stories/1060070605/>.

ⁱⁱ Peter Fairley, "How a Plan to Save the Power System Disappeared," *The Atlantic*, August 20, 2020, accessed here: <https://www.theatlantic.com/politics/archive/2020/08/how-trump-appointees-short-circuited-grid-modernization/615433/>.

ⁱⁱⁱ Annie Snider, "Sources: EPA blocks warnings on cancer-causing chemical," *Politico*, July 6, 2018, accessed here: <https://www.politico.com/story/2018/07/06/epa-formaldehyde-warnings-blocked-696628>.

^{iv} U.S. Department of Commerce, Office of Inspector General, "Evaluation of NOAA's September 6, 2019, Statement About Hurricane Dorian Forecasts," Final Report No. OIG-20-032-I, June 26, 2020, accessed here: <https://www.oig.doc.gov/OIGPublications/OIG-20-032-I.pdf>.

^v Kelsey Brugger, "EPA cancels race-related training sessions," *E&E News*, September 16, 2020, accessed here: <https://www.eenews.net/stories/1063713885/>.

^{vi} Union of Concerned Scientists, "Science Under President Trump: Voices of Scientists across 16 Federal Agencies," August 2018, accessed here: <https://www.ucsusa.org/sites/default/files/attach/2018/08/science-under-trump-report.pdf>.

^{vii} Kelsey Brugger, "Biden faces 'staggering' loss of government scientists," *E&E News*, February 2, 2021, accessed here: https://www.eenews.net/greenwire/2021/02/02/stories/1063724147?utm_campaign=edition&utm_medium=email&utm_source=eenews%3Agreenwire.

^{viii} U.S. Government Accountability Office, "2013 Sequestration: Agencies Reduced Some Services and Investments, While Taking Certain Actions to Mitigate Effects," GAO-14-244, March 2014, accessed here: <https://www.gao.gov/assets/670/661444.pdf>.

^{ix} David Reich, "Sequestration and Its Impact on Non-Defense Appropriations," *Center on Budget and Policy Priorities*, February 19, 2015, accessed here: <https://www.cbpp.org/research/federal-budget/sequestration-and-its-impact-on-non-defense-appropriations>; Emily Badger, Quoc Trung Bui and Alicia Parlapiano, "The Government Agencies That Became Smaller, and Unhappier, Under Trump," *New York Times*, February 1, 2021, accessed here: <https://www.nytimes.com/2021/02/01/upshot/trump-effect-government-agencies.html>.

^x Rules of the House of Representatives, One Hundred Seventeenth Congress, Rule X, accessed here: <https://rules.house.gov/sites/democrats.rules.house.gov/files/117-House-Rules-Clerk.pdf>.

^{xi} U.S. Environmental Protection Agency, Office of Research and Development, accessed here: <https://www.epa.gov/aboutepa/about-office-research-and-development-ord#researchprograms>.

^{xii} U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, accessed here: <https://www.energy.gov/eere/about-office-energy-efficiency-and-renewable-energy>.

^{xiii} U.S. Department of Energy, Office of Nuclear Energy, accessed here: <https://www.energy.gov/ne/about-us>.

^{xiv} Office of Science and Technology Policy (OSTP) and Office of Personnel Management (OPM), "Reducing the Impact of Bias in the STEM Workforce," *Interagency Policy Group on Increasing Diversity in the STEM Workforce By Reducing the Impact of Bias*, Report Digest, November 2016, accessed here: https://www.si.edu/content/OEEMA/OSTP-OPM_ReportDigest.pdf.

^{xv} *Id.*

^{xvi} *Id.*

STATEMENTS SUBMITTED BY REPRESENTATIVE BILL FOSTER

American Federation of Government Employees
(AFGE) Local 3403
National Science Foundation
2415 Eisenhower Avenue
Alexandria, VA 22314



March 16, 2021

The Honorable Bill Foster, Chairman
The Honorable Jay Obernolte, Ranking Member
The U.S. House of Representatives
Committee on Science, Space, and Technology
Subcommittee on Investigations and Oversight
2321 Rayburn HOB
Washington, DC 20515

Dear Chairman Foster and Ranking Member Obernolte,

Thank you for holding the hearing on “Brain Drain: Rebuilding the Federal Scientific Workforce,” a matter of critical importance to the United States.

I am President of the American Federation of Government Employees (AFGE) Local 3403 representing federal employees in Science, Technology, Engineering, and Mathematics (STEM) fields at the National Science Foundation (NSF) and the Economic Research Service (ERS) and National Institute of Food and Agriculture (NIFA) at the U.S. Department of Agriculture (USDA).

The American STEM enterprise is held in high esteem, worldwide. This position is earned by credible professionals doing credible work. It might be better to describe the situation as one of incredible professionals doing incredible work. This reputation is not borne of privilege, but it is earned. As with all reputations, however, they are hard to earn but once lost, hard to regain. We are at a point at which that hard earned reputation is under attack from inside the American political system. Such a situation is intolerable.

The American people need and deserve a non-politicized civil service workforce. This need is particularly important for the federal workforce in STEM which needs to be fully engaged to tackle critical scientific and technical issues facing our Nation and the world.

Over the last few years, the federal STEM workforce was diminished, hobbled, politicized, and dismissed as irrelevant and part of a “deep state” bent on undermining democracy. The federal STEM workforce, once able to shrug off such insults, found itself overwhelmed by autocratic attacks from the top of the federal government.

The federal workforce endured a number of government shutdowns including the longest in American history. Serious scientists doing serious work were hounded, harassed, suspended, and terminated for political reasons. Pollution went unchecked, climate changes went unaddressed,

health inspections went undone. The COVID-19 pandemic hit America harder than any other country not because of a lack of adequate science understanding but a lack of political fortitude to recognize and face the problem head-on.

Two years ago, the USDA NIFA and ERS saw losses of 70% of their scientific and technical expert staff due to an unnecessary and punitive geographic move out of Washington D.C., the goal of which was to reduce the federal scientific staff (as explained in closed-door remarks by White House Chief of Staff, Mick Mulvaney). These two groups are still decimated with inadequate staff and yet-to-be delivered promises of restaffing to pre-move levels. The critical science and economic research provided by these groups are no longer available to the American agriculture community as a result. The ERS and NIFA staff that could not relocate outside of the Washington D.C. area and were terminated should be welcomed back to the USDA because we need their expertise.

Despite political interference and a deadly global pandemic, the federal workforce has demonstrated integrity and resilience toward their missions. Now the federal government must harness the lessons of the pandemic and build a new federal STEM workforce model.

Here are some ways to do that:

- Extended telework (beyond a single day, as is the policy at USDA) must be established in the federal workforce to decentralize disruptions of federal work.
- Fully remote work must be embraced to allow STEM to move to people instead of people moving to STEM. Let the federal government recruit from Americans who want to serve but cannot change geographic locations due to family or medical reasons. Work is what we do, not where we do it.
- Allow the federal government to establish a physical presence at Historically Black Colleges and Universities (HBCU), Minority Serving Institutions (MSI), Tribal Colleges, Community Colleges, and other institutions to create a buzz about STEM that encourages more students from diverse backgrounds to consider federal and civilian STEM as a career. Move past supporting those institutions and communities already well served by the federal government and make a welcoming place for other institutions and communities. Too many smart people are turned off and away by elitist attitudes solely involving pedigree, not aptitude, at great loss to our society.
- Encourage broad use of federal programs allowing Student Loan Repayment Programs to help recruit and retain federal STEM staff carrying student debt.
- Encourage innovation in dependent-care and elder-care services to assist families. The U.S. cannot be a competitive leader in STEM with absent or byzantine dependent-care and elder-care policies that make people (mostly women) choose between a career in STEM and caring for family. This is simply not civilized or befitting an espoused global leader.
- Modernize federal conflict-of-interest rules and regulations to reflect the way STEM is done these days in highly collaborative, integrated, and international teams. The conflict and ethics rules are outdated and discourage innovation and collaboration by researchers out of fear of breaking a rule or regulation developed during the Cold War era and

promulgated into the 21st century. We can do better and must do so because failure in the STEM arena is not an option for America.

I offer these remarks in the spirit of constructive engagement with the Committee.

Respectfully,

David Verardo

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Statement of the Climate Science Legal Defense Fund

On

Brain Drain: Rebuilding the Federal Scientific Workforce

Before the House Committee on Science, Space, and Technology

March 17, 2021

The Climate Science Legal Defense Fund (CSLDF) respectfully submits this statement to the House Committee on Science, Space, and Technology. CSLDF is a non-profit organization whose mission is to protect the scientific endeavor.

The deeply concerning exodus of scientific expertise from the federal government in recent years is well-documented.¹ This loss has multiple causes, but surely among the most important has been the increasing politicization of science and the resulting harms.² Sidelining sound science that failed to comport with political goals—including creating environments in which many scientists felt the need to self-censor in order to keep their jobs³—fueled a decline in morale among the scientific workforce, and was a driving force behind a loss of scientific expertise and capacity in our federal agencies.⁴

In order to successfully address these problems, federal agencies will need to adopt stronger protections for scientific integrity. Unfortunately, existing scientific integrity policies are often lacking in key areas. For example, they do not always clearly prohibit political interference with science—or only explicitly prohibit certain categories of employees from engaging in such interference, leaving out important, sizeable groups like mid-level managers. Meanwhile, mid-level managers have been responsible for some of the most pervasive efforts to undermine politically inconvenient science, particularly climate research.⁵ Policies at some important scientific agencies have insufficient protections regarding political interference, including the Centers for Disease Control and Prevention (CDC) and the Department of the Interior (DOI).⁶

Similarly, a number of federal scientific agencies also fail to adequately protect the rights of agency scientists to publicly discuss their work, or to share personal opinions as private citizens. For example, the Trump administration successfully prevented CDC

¹ Annie Gowan, Juliet Elperin, Ben Guarino, & Andrew Ba Tran, *Science ranks grow thin in Trump administration*, WASH. POST, Jan. 23, 2020, https://www.washingtonpost.com/climate-environment/science-ranks-grow-thin-in-trump-administration/2020/01/23/5d22b522-3172-11ea-a053-dc6d944ba776_story.html.

² For example, National Institutes of Health scientist Rick Bright resigned from his position in late 2020, citing “frustration with the Trump administration’s disregard for scientific expertise.” Giuliana Viglione, *Four ways Trump has meddled in pandemic science—and why it matters*, NATURE, Nov. 3, 2020, <https://www.nature.com/articles/d41586-020-03035-4>.

³ Jacob Carter, *Government Scientists are Censoring Themselves*, SCIENTIFIC AMERICAN, Observations, Aug. 5, 2019, <https://blogs.scientificamerican.com/observations/government-scientists-are-censoring-themselves/>.

⁴ Kelsey Brugger, *Biden Faces ‘Staggering’ Loss of Government Scientists*, ENERGY & ENVIRONMENT NEWS, Feb. 2, 2021, <https://www.eenews.net/stories/1063724147>.

⁵ Lisa Friedman, *A War Against Climate Science, Waged by Washington’s Rank and File*, N.Y. TIMES, June 15, 2020, <https://www.nytimes.com/2020/06/15/climate/climate-science-trump.html>.

⁶ This and other arguments articulated in this statement also appeared in a recent opinion piece by CSLDF Staff Attorney Augusta Wilson, published in Undark Magazine. See Augusta Wilson, *How Do We Protect Science From the Next Trump?*, UNDARK MAGAZINE, Feb. 25, 2021, <https://undark.org/2021/02/25/protect-science-integrity/>.

scientists, who have only weak communication rights, from speaking in February 2020 about the imminent threats from COVID-19.⁷

The devastating impacts when science is politicized or censored have been made all too tragically clear as the COVID-19 pandemic raged out of control over the past year. These failings have damaged climate science particularly acutely in recent years. The Trump administration dismissed climate change, despite the global scientific consensus, and notoriously impeded climate-related research.⁸

In addition to these important substantive gaps, existing scientific integrity policies frequently suffer from significant structural flaws. In a number of instances, policies fail to establish clear and straightforward processes for the filing, evaluation, investigation, and resolution of scientific integrity complaints. In many cases, they also do not clearly protect those who file complaints in good faith, or who participate in the investigation or adjudication of a complaint, from retaliation. These failings can discourage those who are aware of scientific integrity violations from reporting them and further contributes to low morale and, ultimately, “brain drain.”

President Biden’s January 27, 2021 Memorandum on scientific integrity requires federal agencies to review and strengthen their policies.⁹ Improvements are sorely needed, and CSLDF has developed a model scientific integrity policy that addresses common shortcomings in existing policies.¹⁰ For example, our model policy explicitly prohibits political interference with research, contains robust conflict of interest provisions, and protects the rights of those involved in scientific activities to speak freely about their research. It also establishes clear procedures for filing, investigating, and resolving a scientific integrity complaint. Many of these important improvements are also reflected in the Scientific Integrity Act, as introduced by Rep. Paul Tonko and co-sponsored by many other members of this Committee.

⁷ Michael D. Shear & Maggie Haberman, *Pence Will Control All Coronavirus Messaging from Health Officials*, N.Y. TIMES, Feb. 27, 2020, <https://www.nytimes.com/2020/02/27/us/politics/us-coronavirus-pence.html>.

⁸ See Brad Plumer & Coral Davenport, *Science Under Attack: How Trump Is Sidelining Researchers and Their Work*, N.Y. TIMES, Dec. 28, 2019, <https://www.nytimes.com/2019/12/28/climate/trump-administration-war-on-science.html>. See also, Romany Webb, Lauren Kurtz & Susan Rosenthal, *When Politics Trump Science: The Erosion of Science-Based Regulation*, 50 E.L.R. 10708 (Sept. 2020), <https://climate.law.columbia.edu/sites/default/files/content/Webb%20et%20al.%20--%20When%20Politics%20Trump%20Science%20--%20Sept.%202020.pdf>.

⁹ Pres. Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking (Jan. 27, 2021), <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/>.

¹⁰ Climate Science Legal Defense Fund, *Model Scientific Policy for Agencies, Universities, and Research Institutions*, <https://www.csldf.org/resource/model-scientific-integrity-policy/>

Strengthening agency scientific integrity policies is a crucial step towards repairing morale at scientific agencies and reinvigorating the federal scientific workforce. But it is insufficient. Even the most robust policy means little if it is not well enforced. Unfortunately, lack of confidence that scientific integrity violations will be taken seriously appears to be a significant problem: a 2020 survey by the EPA's Office of the Inspector General found that hundreds of EPA employees were aware of scientific integrity violations but did not report them.¹¹ Many of the employees said they chose not to report because they believed it wouldn't matter.

Agencies have too often taken off-ramps rather than confront violations of their scientific integrity policies, and recent years have shown us that this problem becomes particularly acute when the violations are committed by those in the highest rungs of power within the agency. Scott Pruitt, while he was head of the Environmental Protection Agency, publicly asserted, contrary to scientific consensus, that there is "tremendous disagreement" about carbon dioxide's influence on climate, and that we don't yet know if "it's a primary contributor to the global warming that we see." In doing so, he was clearly violating the provisions of EPA's scientific integrity policy that require agency employees to present scientific information to the public accurately and with appropriate contextualization. Nonetheless, and probably unsurprisingly, an EPA scientific integrity review panel cleared him of wrongdoing on the dubious theory that he was simply expressing an opinion.¹² Similarly, when the acting chief of the National Oceanic and Atmospheric Administration succumbed to political pressure to support then-President Trump's bizarre assertion that Hurricane Dorian would hit Alabama, an independent panel found that he and the agency's then-communications director had violated the agency's scientific integrity policy. Yet no one was disciplined.¹³

In order to create environments in which federal scientists can thrive, scientific agencies clearly need to take steps to ensure that threats to science from high-ranking officials will be independently investigated, and that meaningful remedial action will in fact be taken if those investigations do indeed reveal violations of scientific integrity. More broadly, agencies must commit themselves to fundamentally strengthening the culture of scientific integrity via thorough and consistent training on applicable scientific integrity policies. At minimum, training must include clear, specific, and detailed guidance on: (1) what constitutes a violation of scientific integrity; (2) how scientists and others can report a suspected violation of scientific integrity; (3) what the agency's

¹¹ U.S. Environmental Protection Agency, Office of Inspector General, *Further Efforts Needed to Uphold Scientific Integrity Policy at EPA*, 10 (May 20, 2020), https://www.epa.gov/sites/production/files/2020-05/documents/_epaig_20200520-20-p-0173.pdf

¹² Letter from Thomas H. Sinks, Jr., Director, Office of the Science Advisor, U.S. EPA Scientific Integrity Review Panel, to Elena Saxonhouse, Senior Attorney, Joanne Spalding, Chief Climate Counsel, Sierra Club, http://blogs2.law.columbia.edu/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2017/20170801_docket-na_letter-1.pdf.

¹³ Seth Borenstein, *Panel: NOAA Bowled to Political Pressure in Dorian Dispute*, ABC News, June 16, 2020, <https://abcnews.go.com/Technology/wireStory/panel-noaa-bowed-political-pressure-dorian-dispute-71282013>.

process is for evaluating, investigating, and resolving scientific integrity complaints; and (4) the protections that exist for those who file a complaint in good faith, for those who are accused of committing a violation, and for those who participate in good faith in an investigation process.

This may seem like common sense, but not all federal employees who participate in scientific activities on behalf of their agencies currently receive this kind of training. A recent report by the U.S. Government Accountability Office examined nine agencies and found that four of them—the Federal Aviation Administration, the National Aeronautics and Space Administration, the National Institute of Standards and Technology, and the Office of Fossil Energy—offer no such training to their employees and affiliates, and the latter two agencies have not taken any actions at all to promote their scientific integrity policies with their staff.¹⁴ Agencies need to make scientific integrity training a regular habit. Doing so will empower both current and future generations of scientists. It will help to create environments that are resilient against the kinds of threats to science we have seen all too frequently over the past four years, and help to inoculate agencies against “brain drain.”

We strongly believe that if agencies strengthen their scientific integrity policies, and take steps—like consistent training of everyone at the agency—to foster a culture of scientific integrity among their ranks, they can reinvigorate federal science and improve retention by building environments in which talented researchers are confident that they will be supported and encouraged rather than marginalized and silenced.

If you have any questions, please contact our Executive Director, Lauren Kurtz, at lkurtz@cslsf.org or (646) 801-0853, or Staff Attorney Augusta Wilson, at awilson@cslsf.org or (646) 820-6490.

¹⁴ U.S. Government Accountability Office, Report to the Ranking Member, Committee on Commerce Science, and Transportation, U.S. Senate, Scientific Integrity Policies: Additional Actions Could Strengthen Integrity of Federal Research, 12 (April 2019), <https://www.gao.gov/assets/700/698231.pdf>.

The Federal Brain Drain

Impacts on Science Capacity, 2016-2020

<https://www.ucsusa.org/resources/federal-brain-drain>

Jacob Carter

Taryn MacKinney

Gretchen Goldman

January 30, 2021

CONTENTS

Introduction

Scientific Capacity Across Agencies

Figure 1. Federal Scientists Under Trump	4
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Environmental Protection Agency--A Case Study

Figure 2. EPA Science Staff, 2016-2020	5
Figure 3. Trends by Job Series	6
Figure 4. Trends by Federal Grade	7
Figure 5. Trends by Office	8

Environmental Protection Agency--A Case Study

Figure 6. 2018 Survey of Scientists	10
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Conclusion

Introduction

Scientific expertise is fundamental to the ability of many federal agencies to fulfill their missions. Agency scientists inform decisions that keep our air and water clean and our food safe, track disease outbreaks and ensure that we have effective responses, and tackle pressing scientific issues like climate change. It is critically important that our federal agencies have the scientific capacity they need to fulfill their science-based missions and protect the public. A loss of expert scientists means a loss of scientific research and slower progress on critical issues of public health and safety.

The Trump administration attacked science, federal scientists, and their work on an unprecedented scale. We documented more than 180 instances of political interference in science under the Trump administration, and multiple surveys have indicated that federal scientists' morale reached an all-time low during these years.

This pattern of attacks also damaged our nation's science capacity. For example, the US Department of Agriculture's Economic Research Service and National Institute of Food and Agriculture lost 75 percent of its employees when the Trump administration hastily relocated these offices to Kansas City, Missouri. The resulting "brain drain" has delayed the completion of dozens of studies on a range of issues including veterans' food security, international trade markets, and the opioid epidemic's impacts on rural communities.

Here, we provide analyses showing the number of scientists lost or gained across and within science-based federal agencies under the Trump administration. Some agencies, such as the Environmental Protection Agency (EPA), lost a significant number of scientists, while others, such as the National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA), saw an increase.

To obtain data for this analysis, we submitted Freedom of Information Act (FOIA) requests to federal agencies with significant scientific capacity, asking for personnel and attrition records going back many years. We used the datasets we received, in conjunction with Office of Personnel Management (OPM) job series, to analyze trends in staffing by fiscal years and quarters, job grades, job series, and other metrics.¹

For the purposes of this study, we define "scientists" as anyone belonging to a job series that involves some level of scientific training or expertise, including but not limited to research, operations, modeling, inspection and oversight, and science policy. We identified these positions using the series codes and names of the OPM Handbook of Occupational Groups and Families, Part I (White Collar Occupational Groups and Series).

The data are organized by fiscal year (FY), rather than calendar year. Each fiscal year begins in October: the first quarter (Q1) is October to December; Q2 is January to March; Q3 is April to June; Q4 is July to September. We averaged the four FY quarters to yield the number of scientists for each year; US Geological Survey (USGS) quarters are represented by the last pay period of each.

Scientific Capacity Across Federal Agencies

In our investigation, we found :

- The Bureau of Ocean Energy Management (BOEM) lost 6 percent of its scientific staff from 2016 to 2019 (a loss of 28 scientists) but gained 19 scientific experts in the last year.
- The NSF saw the largest gain of all agencies investigated, with a nearly 10-percent increase in scientific staff (an increase of 79 scientists).

Figure 1. Federal Scientists Under Trump

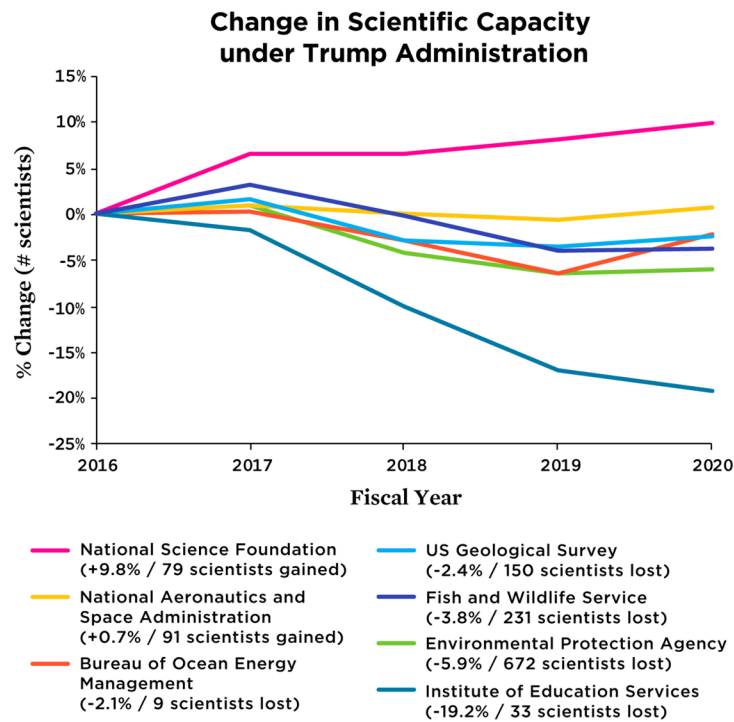


Figure 1. Year-to-year percent change in the number of scientists at five federal agencies, from fiscal year (FY) 2016 to 2020. The EPA had the biggest loss of scientists, sustaining a 6 percent decrease from 2016 to 2020, with more than 670 fewer scientists in 2020 than in 2016.

Environmental Protection Agency—A Case Study

Given its significant loss of scientific capacity, we took a deeper look into the EPA. We found :

- The EPA lost more than 1,000 scientists between its highest reported number of scientists in Q2 of 2017 and its lowest reported number of scientists in Q4 of 2019.
- On average, the EPA lost about 219 scientists per year between 2016 and 2020.

Figure 2. EPA Science Staff, 2016-2020

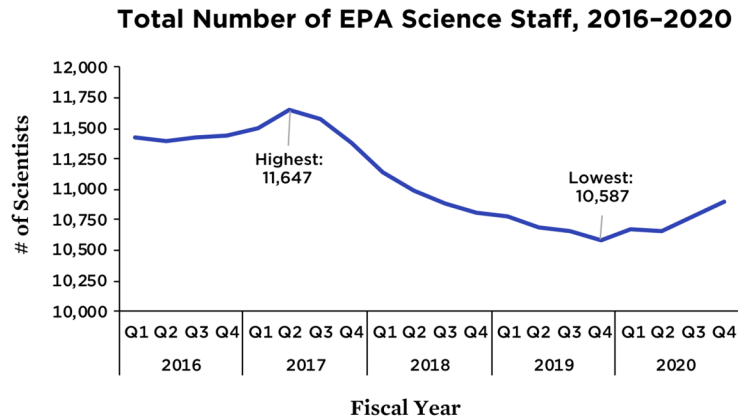


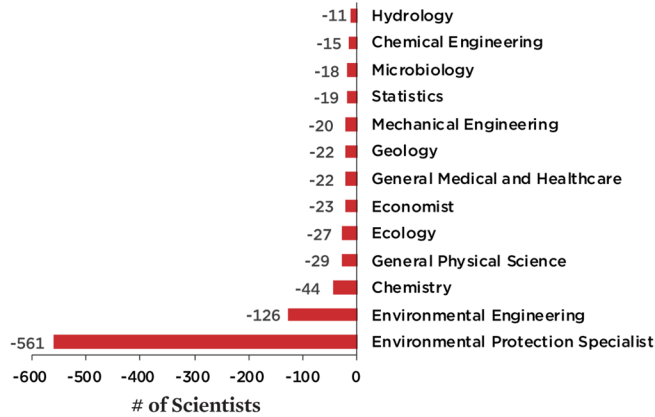
Figure 2. The EPA lost hundreds of scientists during the past four years—on average, 219 scientists per year.

- Overall, the EPA saw increases in some job series, but significant losses in far more.
- The EPA lost more than 500 environmental protection specialists, a 24 percent decline. Their duties include working to protect or improve environmental quality, control pollution, remedy environmental damage, or ensure compliance with environmental laws and regulations.
- The agency also saw a loss of more than 100 environmental engineers on average—a 7 percent decline. These scientists plan and design environmental systems to provide clean water and air; identify and analyze substances or organisms that degrade the aquatic and soil environment; and measure, analyze, and describe air and water resources.
- The EPA also lost scientists in smaller series. For example, the EPA lost 12 hydrologists, 22 geologists, and 18 statisticians—about a third of jobs in each series. The EPA also lost 18 microbiologists (nearly 1 in 4 microbiologists at the EPA), and 27 ecologists (1 in 5).

Figure 3. Trends by Job Series

EPA Job Series with Biggest Losses/Gains

a. 10 or More Employees Lost



b. 10 or More Employees Gained

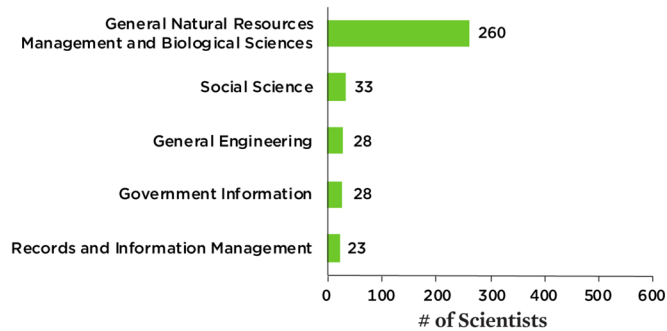


Figure 3. A number of scientific job categories (called series) at the EPA lost or gained 10 or more employees from FY 2016 to 2020. The EPA lost more than 550 environmental protection specialists (EPS)—nearly a quarter of EPS jobs—and gained nearly 250 jobs in general natural resources management and biological sciences, a 22 percent increase.

- More scientists were lost at lower grades than at higher grades between 2016 and 2020. Scientists at GS-14 and GS-15 levels only lost 3 to 5 percent of staff, whereas scientists at the GS-10 level lost 35 percent. Typically, the more experience and/or training, the higher the grade, so this may mean the EPA has fewer junior scientific staff to ascend in the agency.

Figure 4. Trends by Federal Grade

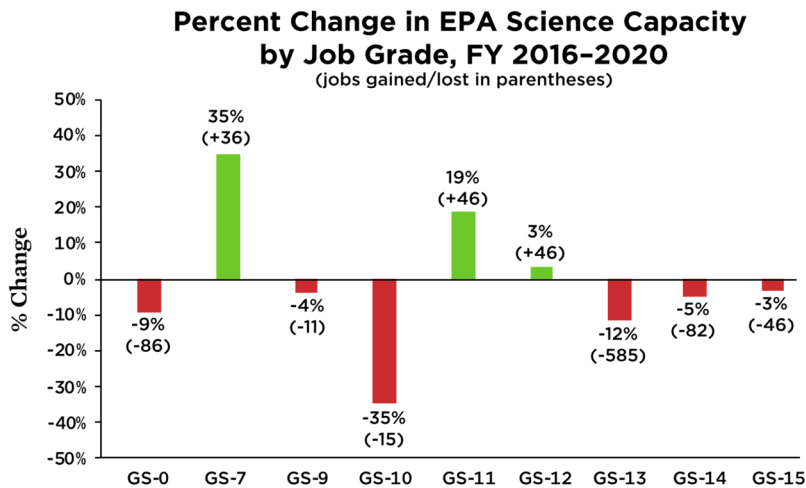


Figure 4. A range of federal grades gained or lost 10 or more employees from FY2016 to 2020.

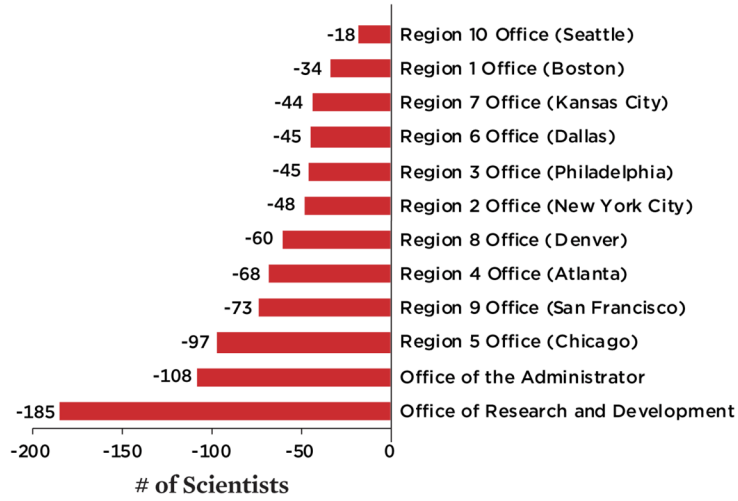
- Loss of scientists was widespread across programmatic and regional offices (Figure 5).
- All regional offices lost scientists under the Trump administration, with regions 2 and 9 losing 8 and 14 percent of their scientific staff, or 84 and 79 employees, respectively.
- The Office of Research and Development, the EPA's research arm, lost more than 12 percent of its scientific staff (185 staff total) from 2016 to 2020.

Offices that were merged or renamed are not included in the figures above. In Q4 2016, the Obama administration EPA changed the name of the Office of Solid Waste and Emergency Response (OSWER) to the Office of Land and Emergency Management (OLEM). In FY 2018, the Office of Administration and Resources Management (OARM) and the Office of Environmental Information (OEI) merged into the new Office of Mission Support (OMS).

Figure 5. Trends by Office

EPA Offices with Biggest Losses/Gains

a. 10 or More Employees Lost



b. 10 or More Scientists Gained

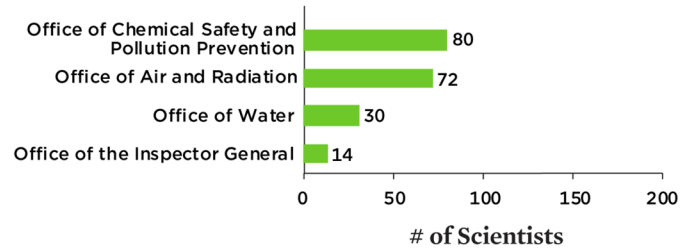


Figure 5. Every regional office and several programmatic offices lost 10 or more scientists from FY 2016 to 2020, while other offices gained 10 or more staff.

Capacity Loss and Morale

The Trump administration's attacks on science created a work environment in which many scientific experts reported low morale. The administration's open disdain for science may have deterred scientists from seeking positions at the EPA and other agencies or discouraged current federal scientists from filling the positions of senior scientists who left for reasons such as early retirements, buyouts, or sustained hiring freezes.

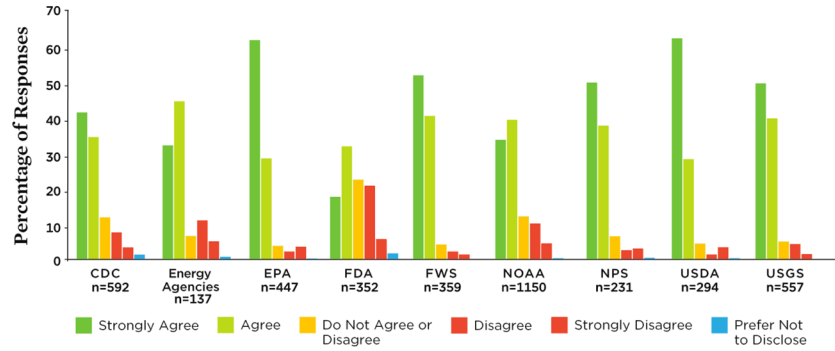
In our 2018 survey of federal scientists at 16 science-based agencies, 79 percent of respondents (3,266) reported workforce reductions in 2017 due to staff departures, retirements, or hiring freezes (Figure 6). Of the respondents who noticed workforce reductions, 87 percent (2,852) reported that such reductions made it more difficult for their agencies to fulfill their science-based missions.

The survey results also indicated that morale and job satisfaction were low for scientists under the Trump administration. Across all agencies, 39 percent of responding federal scientists (1,624) reported that the effectiveness of their divisions or offices had decreased in 2017, and 46 percent of scientists surveyed reported an overall decrease in job satisfaction during the same period.

Figure 6. 2018 Survey of Scientists

Workforce Reductions: Agency Scientist Survey Responses

a. I have noticed workforce reductions in the past year



b. Limited capacity affects fulfillment of my agency's mission

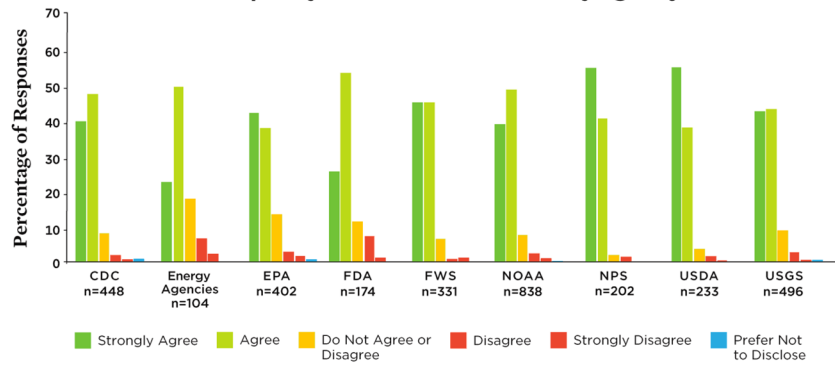


Figure 6. Responses from federal scientists to two survey prompts: “In the past year, I have noticed workforce reductions at my agency due to staff departures, retirements, and/or hiring freezes.” and “Such workforce reductions have made it more difficult for my agency to fulfill its science-based mission.” Across all agencies surveyed, respondents strongly agreed that they had noticed workforce reductions. More than 90 percent of responding federal scientists at the EPA agreed that the agency’s workforce had been reduced over the past year; of those scientists, more than 40 percent strongly agree the reductions have made it more difficult for the EPA to fulfill its mission.

Conclusion

Our data show that some agencies, such as the EPA, have seen significant losses in scientific capacity. These agencies make decisions that protect the health and safety of the public and the health of our environment—critical missions that will be difficult to fulfill if the agency lacks needed expertise. The Biden administration should work quickly, starting on day one, to restore scientific capacity to agencies that have lost scientists.

Moreover, merely restoring what was lost is not enough: The new administration should work to build and strengthen scientific capacity beyond pre-2017 levels. The administration also should work to diversify the scientific workforce at federal agencies and revitalize the pipeline that brings early career scientists into federal service.

We recommend that, in addition to taking steps to strengthen the role of federal science and scientific integrity across the government, the Biden administration:

- Increase the number of early career scientists entering the federal government by strengthening scientific fellowship programs.
 - This could include, for example, reinstating the STEM-specific track of the Presidential Management Fellowship program.
 - Early career fellowships already exist in some federal programs, (e.g., Sea Grant, Oak Ridge Institute for Science and Education) and the Biden administration should consider funding similar fellowships that tackle other science-related issues such as climate change or equity and environmental justice.
- Increase public access to information and training on how to apply for federal positions on USAJobs.gov. Every effort should be made to provide such information to members of communities that have historically been underrepresented in federal scientific positions—for example, by hosting events at historically black colleges and universities and tribal colleges.
- Train mid-career and senior-level scientists to effectively mentor early career staff. Federal agencies should implement and increase such trainings if they already exist, and develop them if they do not.
- Signal strong support for increased scientific capacity in the White House science and technology budget, which sets the administration’s priorities for federal research and development.

These are some initial steps that the Biden administration may follow to begin strengthening the federal scientific workforce; however, rebuilding scientific capacity so that agencies can fulfill their important missions to protect public health and safety will take time. Therefore, the Biden administration should work hard to restore scientific experts to federal agencies on day one, focusing on agencies that have been hit hardest, such as the EPA. Bringing

scientific expertise back to government will ensure that science can protect our environment, keep the public safe, and foster a healthier future for all.

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ENDNOTES

1. See a more detailed methodology at https://www.ucsusa.org/sites/default/files/2021-01/federal-brain-drain-methodology_0.pdf.

